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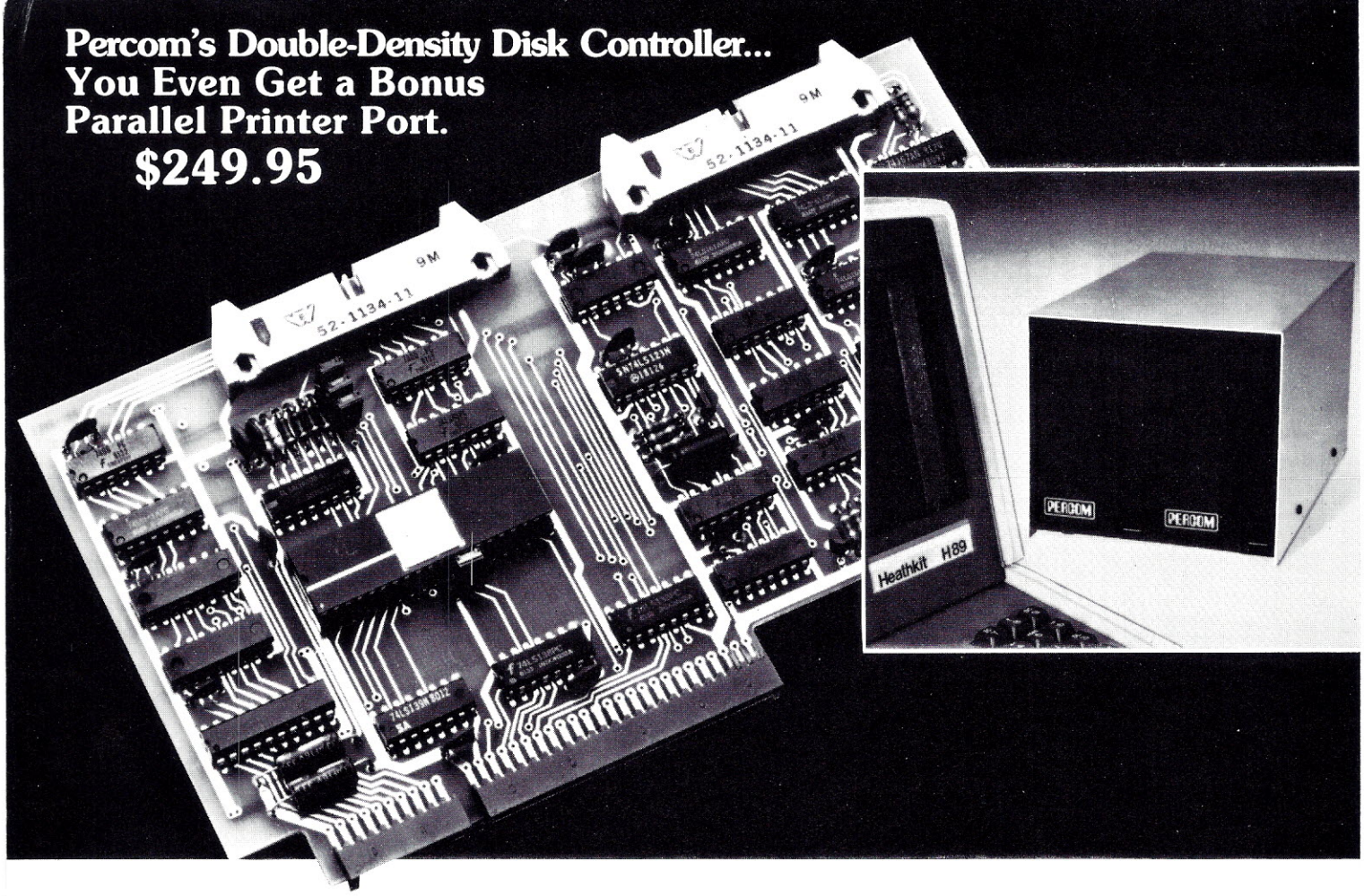


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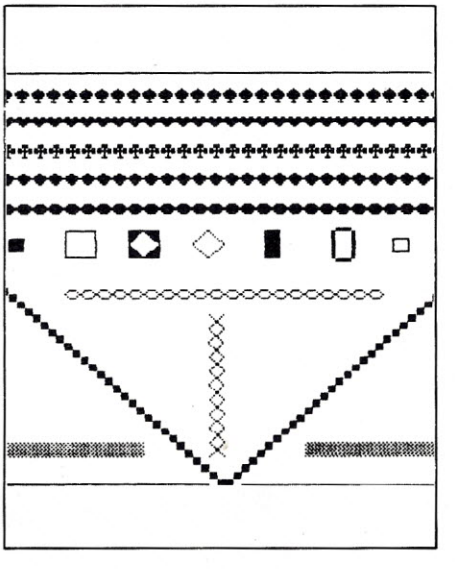
With these new Prism printers, color printing is no longer expensive.

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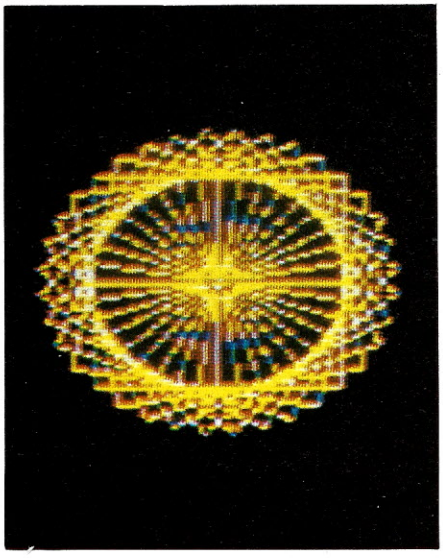
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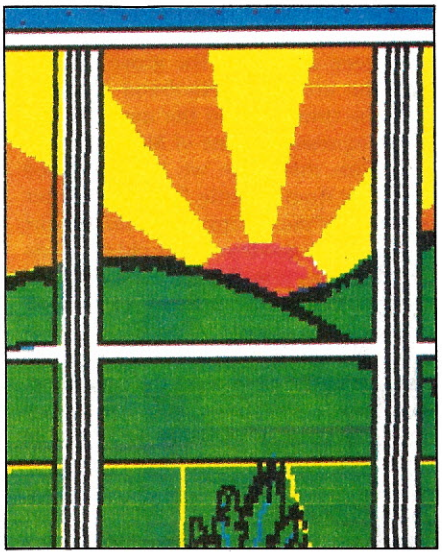
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By Wayne Green

Goodbye To Kilobaud



The New Hobbyists

It doesn't take long in the microcomputer field to become an old-timer, so as one who got started with the original Mits Altair, I probably qualify. Those were hardy pioneer days and I'm glad I was there to enjoy them. But they will not be missed.

The whole microcomputer field was originally supported entirely by electronics hobbyists. No one else could have survived those times. Many of our manufacturers were busy selling kits of parts which, when assembled, did not work. Even the engineering prototypes had never worked correctly. The thinking was that the hobbyists would solve the problems the manufacturer had failed to work out and pass along the solutions, and that eventually we would have working computers. They were right—that's just how it worked out.

One of the surprises during the first year, 1975, was that there were as many naive hobbyists as there were. Some of the firms were not satisfied with shipping kits to make unworking computers; they found other more exotic ways to shoot themselves in the foot. I remember one, long deceased, that went to the trouble to stick all of the kit parts—including the memory chips—into foam plastic, complete with stencilled marking. The problem, it developed, was that sticking the chips into the plastic generated thousands of electrostatic volts and blew them to smithereens. That was a great joke on the hobbyists, who wondered why their systems arrived with defunct chips.

When I got an idea of what the microcomputer industry was going to grow into I quickly started *Byte* magazine; that was in mid-1975. It took off fast and was an immediate success. A year later, feeling there was a need for a magazine aimed more at the newcomer to computers, I started this publication.

At that time, with virtually nothing available for programs, with even disk systems still not really working, and with our more modern microcomputers still a glint in the eye of their designers, one had to be a dedicated hobbyist to spend the money and time for so little in the way of useful equipment. Thus *Kilobaud*, when it started, was aimed at the hobbyist of the early days—the hobbyist of 1976. The name itself was kind of representative of the state of the industry, a kilobaud being a high-capacity data channel, which seemed appropriate for the magazine.

Then, with the PET, the TRS-80 Model I, and other plug 'em in and let 'em run computers, the type of buyer of micros slowly began to change. People who began buying systems were more interested in what they could do than in the gee-whiz of owning a computer and struggling with it. By 1979 the old type of hobbyist was fading away, being replaced by a new style of hobbyist, one more interested in using the computer than in building and playing around with the hardware.

To keep abreast of the growth of the field the articles in *Kilobaud* changed with the times, as did the name, to the more expressive name of *Microcomputing*. With this issue we have dropped *Kilobaud* from the title. You know, after five years of publishing *Kilobaud*, we sort of hate to say goodbye to the old name, as out of date as it is. But it seems unfair to the marketing department to put off prospective readers with an old-fashioned name, one which isn't as expressive of the mission of the magazine. Remember, the more subscribers we have, the more advertising we'll be able to attract, and the more ads, the more pages of material we'll be able to bring you each month.

Microcomputing is being edited for the owners of microcomputers, bringing articles which will carry on from where the documentation for your system leaves off. Now that you have a computer system, you want to learn more and more things you can do with it. You want programs to run, and you want to get an idea of how the thing works, how to fix it and what is available in accessories and programs.

I have four magazines in the micro field. There is *Desktop Computing* for the businessman who does not yet have a computer. This magazine is nontechnical, with all of the buzzwords edited out so the material is simple to understand. *Desktop* emphasizes the uses for small computers in business and education.

Then there is this publication, *Microcomputing*, which I've explained. A sort of companion magazine is *80 Microcomputing*, which does about the same, but is strictly for the owner of a TRS-80 system. It's not only packed with programs every month, but we also have these programs available on a cassette so they don't even have to be typed in. They'll soon be out on disk, too.

The fourth is *Microcomputing Industry*, which is a controlled-circulation monthly magazine sent to the industry. This is filled with avuncular advice on how to run computer stores and how to advertise, and news of interest to the industry. It's available to qualified industry people.

Schools Self-Destructing

The theft problem for most software firms is annoying, but not so bad that it is stopping the development and marketing of software. It is indeed unfortunate that a small percentage of the people are crooks, for this makes it impossible for software firms and dealers to deal with all customers as though they were honest.

Where the situation is much more disastrous is in the educational field. We're already seeing a rapid slowdown of educational software coming on the mar-

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ket. There's no sign that this trend is going to change. You see, the problem here is that most software firms have discovered that after they go to the expense of producing a good educational program, about the best they can hope for is the sale of one per school.

Now, even if programmers didn't stop writing for such a market, you may be sure that the program publishers are going to find better places to spend their development and publishing money . . . and quickly. One of the reasons that there are so few large program-publishers is that it is almost unbelievably expensive to evaluate, document, duplicate, package, advertise and sell programs. It's costing my Instant Software division about $3000 per program for the process, with the costs rising as programs get ever more complex. Without some way to recoup that investment there can be no programs.

Schools seem to have the idea that unlike books, all they need to do is buy one copy of a program and then duplicate it when more copies are needed. If it was as easy and inexpensive to duplicate books, I assume that schools would buy one copy of each textbook and then start the copy machine running for all others needed. That would stop the supply of textbooks in a hurry, just as it is stopping the supply of programs.

Until schools work out some system for charging for each use of a program and getting that money back to the publisher of the program, it is unlikely that many sophisticated programs are going to be written for educational use. Indeed, the present situation could pretty much stop the development of educational software.

It may be possible to use free labor (slave labor, it you like), where students are encouraged to write programs which are then swapped with no income for the programmer. I think this system will not result in much good software, and it would further discourage any commercial efforts at solving the problem.

There has been some dismay expressed in articles reviewing the state of computer education in our schools. The plain fact is that there has been an absence of direction or progress, with no one seeming to understand just what has gone wrong.

The school market for microcomputers has been confused by the large number of schools buying systems, but without any real plan for their use. The general idea has been to promote "computer literacy" rather than computer-aided instruction (CAI), which was the heralded use. With little available in software other than games, CAI has remained in the future. I'm sure that Instant Software hasn't been the only software publisher to notice that educational programs sell one copy per school, with the result that they have been phased out as a product because of the overall poor sale.

We're seeing a rapid slowdown of educational software coming on the market.

Since schools seem to be able to survive the cost of books for students, is it any more ridiculous to expect students to buy their own programs than to expect them to buy their texts?

Until some solution is found to the theft of programs by schools, I think there will be little real progress toward serious uses of microcomputers in schools. It's a pity, for there are many applications where micros could be extremely helpful to students and teachers, making learning easier and more fun, and thus saving time and money in the educational process.

In the past I've mentioned the possibility of my publishing a magazine aimed at helping the educational micro market to grow . . . something along the line of *Desktop Computing*, but school-oriented. I really don't think this market can develop until some solution to the software problem is worked out. And without the programs, who needs microcomputers?

Author's Guide

With microcomputer books selling up a storm, authors are coming out of the woodwork everywhere. And you know, despite the fact that there is a very active book division to Wayne Green, Inc., I get letters from authors asking how they should pick a publisher.

Well, since our book department is pretty well signed up for 1982 (oh, I suppose they could cram in a couple more books, if they looked really good), I'll discuss the situation briefly (a first).

One thing that authors do not seem to understand about publishers is that there are two processes involved in publication. The first, and easiest, is setting the type, putting the book together and printing it. Heck, anyone with some printing background can do that. No, that is not the major service a publisher provides. The big deal is distribution. Ask any published author.

Just to give you an example, I got a call recently from a well-known micro author. He'd had a very nice book published by one of the big names in the business. The publisher is a good friend of mine, so he shall remain nameless. The book, if properly promoted and advertised, should have sold a bunch of copies, but the author has been unable to get any action from the firm, so the book has been languishing.

Worse, the first print run was a small one, so the author moved heaven and earth to get all of the revisions in before the second printing. You guessed it—they went ahead and printed it again, ignoring the corrections. They didn't even put in an errata sheet!

Okay, if you have a best-seller bottled up in you, I would suggest you move very carefully when you deal with publishers. The key to your royalties lies in their promotion and advertising of your book. If no one knows about it, it isn't going to sell.

One of the services our book department offers authors is monthly ads in several magazines, plus a nationwide group of reps visiting the computer, electronic and other book stores, setting our books on the shelves and seeing that they're visibly displayed. Then there are new product releases to dealers, and review copies to all the magazines, and so on. After a while you build up a group of people who know how to get the best coverage for a new book.

So before you jump into the arms of a book publisher you should take a very close look at how likely it is that they are going to be promoting your book. How many pages of ads do they run a month? What kind of service do they provide their dealers? How much publicity do their books get in the magazines? After all, you're after royalties, not just a letter of thanks and a few author copies of your book for the shelf.

Programmer Alert

Every now and then something goes wrong with our computers. The question immediately arises: what happened? Was it a program bug or something in the hardware? That's when it would be most comforting to whip out a diagnostic disk and run the system through its paces. A test series should check out the computer memory exhaustively. It should check out the CPU functions. It should check disk write and read. It should check out the peripherals.

Most of the manufacturers have these diagnostics for their own use, but have not made them available to us. Wouldn't you like to be able to throw in a disk and make sure that your ROM is still perfect? Or that something hasn't gone wrong somewhere in your CPU? When we live in an age where a passing gamma corpuscle can zap a memory location, we need to have the tools for self-diagnosing our computers.

A couple of years ago I suggested that programmers work out diagnostics which might be distributed by Instant Software. This is still an open avenue for making some very handsome royalties. I know that diagnostics for the popular computer systems would sell exceedingly well.□



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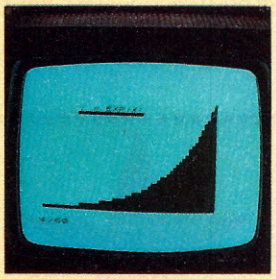
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By Robert W. Baker

Souped-Up PET/CBM

With 16-Bit Board from Digital Acoustics

DTACK Grounded

Want faster operating speed and higher performance from your PET/CBM? Digital Acoustics, Inc., has a new add-on board for the Commodore systems (besides others) that adds a 68000 16-bit microprocessor. The 68000 does not replace the PET's original 6502 processor; it works in conjunction with the 6502 improving its capabilities. The 6502 passes commands to the 68000 telling it what is to be done. The 68000 performs the desired function and returns the results. In this way, the 68000 works as an "attached processor" improving overall system performance.

The DTACK Grounded board derives its name from the fact that a very simple 68000 system can be built by grounding the data acknowledge pin of the 68000. This drastically simplifies the bus interface between the 68000 and the rest of the hardware. Normally, the DTACK pin is used to synchronize data transfers on the 68000 bus and this process can be very complex. The method developed by Digital Acoustics has made it much easier to construct very simple 68000 systems.

The actual printed circuit board is 6½ by 15 inches and mounts inside the PET. There is room for up to 92K of memory on the basic 68000 board, but you can get it with as little as 4K. A separate power board also mounts inside the PET and attaches to the PET's power transformer. There should be room and reserve power for a 128K memory expansion board as well, but this hasn't been confirmed. If you want to add another 512K of expansion memory, it will definitely have to mount outside the PET and a separate power source will have to be provided. All this memory is for the 68000 and is not connected to the 6502 address space. However, a 2K block of additional static RAM is attached to the PET starting at location $8800 of the 6502 address space.

On power-up, the PET is in control and can reset the 68000 at any time. The interface between the 6502 and the 68000 is via an eight-bit data byte with two status bits for handshaking. The 68000 runs at full speed, all the time, currently running at 8 MHz.

An 8087 floating-point math processor board is also planned, once chips are available from Intel. This should increase floating-point processing by about 125 times as compared to the original 6502 alone. Until the 8087 is available, floating-point routines are available in the 68000 and are about 13 times faster than in the 6502.

So far, the 68000 board will only work with the 8032 or 4016/4032 models. The PET must have 24-pin ROMs mounted in sockets. The "fat" PETs (40-column machines with 12-inch screens) have the ROMs soldered in and the 68000 board cannot be used in them. When adding the board to a 4016/4032 there are no changes to the original PET hardware. On an 8032, one trace must be cut on the main printed circuit board and a 74LS32 chip must be added to decode the added RAM and the 68000 interface for the 6502. In either case, you must replace one of the existing PET ROMs. Digital Acoustics will not provide the new ROM due to copyrights on the software within the ROM. You must burn your own 2532 EPROM with nine jump instructions added to the original UD9 ROM.

A collection of 6502 utilities are provided in a 2532 EPROM, assembled to plug into the $A000 socket (UD11). Source code of the binary code in the EPROM will be included. This ROM provides various utility routines to communicate with the 68000. All entries to the ROM are via jump tables to allow future changes and additions without changing any software using the ROM.

The upper 1.5K of the user ROM has 68000 floating-point routines assembled to run in a minimum 4K 68000 DTACK Grounded board. This code must be transferred to the 68000 RAM before being used. Once it is transferred, floating-point functions can be performed by either the 6502 or the 68000, depending on a one-byte flag in the 2K private RAM ($8800—88FF). When using the 68000 board for floating-point functions, Basic programs can be loaded and run without any modifications. Use of the 68000 to perform the math is completely transparent to the user and to the Basic program itself.

Another interesting point is that the 68000 board also works with programs generated with the DTL compiler for the 8032/8050. Actually, it should work with any complier without modifications as long as the compiler generates calls to the floating-point routines in the Basic ROMs.

Currently the floating-point routines are the only functions performed by the 68000. Additional routines are planned to transfer more and more processing to the 68000. You can, however, write your own routines to be run in the 68000. Since the same 68000 board is also being produced for other systems, any general-purpose routines generated for the 68000 board could be used in these other systems as well.

For pricing and more detailed information, you can write Digital Acoustics, Inc., 1415 East McFadden, Suite F, Santa Ana, CA 92705. Prices range from $450 to $1575 depending on the amount of 68000 RAM and whether or not the 68000 chip is included. Prices will drop accordingly as the cost of the 68000 chip decreases.

A DTACK Grounded newsletter is also available at $15 for six issues. This is a journal for simple 68000 systems and provides an ongoing report of current activities with detailed discussions/listings of various 68000 routines.

Multipurpose Interface

I recently received a new product announcement from Teaching Tools: Microcomputer Services announcing a

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.

new multipurpose interface for PET/CBM computers. This is a three-in-one interface that provides a video monitor connector, a sound adapter and an audio tape recorder control.

The video monitor connection lets you display anything on the PET screen onto an external video monitor. This makes large or multiple displays for classroom use very easy to connect. A high-quality rf modulator is also available but can only be used with the older 40-column displays with nine-inch screens. This lets you use a standard TV in place of a video monitor.

The sound adapter has a built-in amplifier, speaker and volume control. It provides the standard CB2 sound interface while taking its power from the PET. No batteries are needed.

The audio tape recorder control lets you add recorded messages to your programs. You then have complete start/stop control of an external audio cassette recorder from within your program.

The interface unit plugs into the back of the PET/CBM and complete instructions are included. Price of the basic multipurpose interface is $109.95 plus $3 shipping. The rf modulator is $40 extra. A sample copy of the instructions is only $1 and can be applied to a later order. For more information you can write Teaching Tools: Microcomputer Services, PO Box 50065, Palo Alto, CA 94303. In Canada you can contact SES Computing, 465 King St. East, Suite 9, Toronto, Ontario M5A 1L6.

EHS's Scroll

Carl Moser of Eastern House Software has come up with another interesting machine-language utility program for the PET, CBM and VIC. The Scroll program provides the ability to scroll forward and backward through a Basic program using the cursor up and cursor down keys. After listing any line of your program, simply position the cursor at the top of the screen and press the cursor up key to scroll backwards through your program. The screen actually reverse scrolls, with the top line displaying the previous Basic program line.

Auto-repeat is enabled on all keys and you can simply hold down the cursor up key to continuously scroll backwards through the program until you find the desired line. Similarly, you can position the cursor at the bottom of the screen and scroll forward through your program until the end. As you can see, it makes program-development work a real snap!

When scrolling, you may want to insert a Basic line or command. To do this you will need a clear line to enter the command.

Well, if you hit the DEL (delete) key whenever you are in column 1 and at either the top or bottom of the screen, the cursor will move to the bottom of the screen and give you a blank line.

The Scroll program initially loads into memory as a Basic/machine-language program. The purpose of the Basic part is to display introductory messages on the screen. When you type Run, the Basic part is deleted leaving only the machine-language scrolling code in upper RAM memory. The program uses approximately 1K of available memory and will not interfere with Toolkit, ROM Rabbit, DOS wedge, etc. However, the Scroll program must be loaded first, before any other utilities.

One small quirk of the Scroll program is mentioned in the documentation. If any Basic program line is longer than 80 characters when displayed, it may cause Scroll to misread the next line number if the 81st character starts in column 1 and is a number. In effect, Scroll may interpret the character as a Basic line number and scroll the wrong line onto the screen. You should be aware but not overly concerned about this since it should be a somewhat rare occurrence.

Eastern House Software is offering this utility for only $6 on cassette or $9 on disk (add $3 for overseas). In return for this surprisingly low cost, they are asking one small favor. Just make five copies of their advertising flier and pass them on to your PET/CBM friends. You get a good-quality program at a very low cost while EHS beats the high cost of advertising.

For more information on this and other fine products you can write Eastern House Software, 3239 Linda Drive, Winston-Salem, NC 27106. If you'd like to see more offers like this be sure to let them know.

VIC Budget

Here's an interesting program for the VIC-20 which can be used to maintain your household budget. It's actually a newer version of a program I originally wrote for the PET several years ago. For those interested, the PET version appeared in the January/February 1980 issue of *Compute*. I thought it might be worthwhile to redo it for the VIC since it was developed for a small system that used cassette tapes.

The program itself provides a simple way of budgeting money for various home expenses with a minimum of effort. It does not use any separate data files, and thus loads very quickly. Instead of using data files, the data to be retained is actually poked back into the program itself and the entire program is resaved on tape. By keeping the data in the first two lines of the program it makes the POKEs very easy to set up.

However, the location used in line 1010 (N=4102) must be changed to N=1030 if the VIC has the memory expansion or you are going to use the program on a PET. This is because the starting location of RAM memory on the standard VIC is different from the normal PET/CBM.

I don't claim to be an accounting expert but the Home Budget program works and serves a very useful purpose. It provides all the desired functions to keep an accurate home budget with a minimum of effort. It does not have any fancy features but simply provides the necessary information in an easy to use format.

Various "accounts" within the budget help to allocate money for different projected expenses. Accounts for bills paid at least once a month are kept in the family checking account where they are readily available. Accounts for other bills, paid at longer intervals, are normally kept in the savings account until needed. An account is established for each major expenditure, such as insurances, home mortgage, utilities, telephone, loans, vacations, etc. All smaller expenses are grouped into a miscellaneous account that is kept in the checking account. An additional account is reserved in the savings account for all "excess" funds, as the true "savings" total.

The program provides a simple way of budgeting money for various home expenses with a minimum of effort.

The names for accounts in the checking account are in line 100 while those for the savings account are in line 120. Unfortunately, the account names must be kept very short—nine characters or less—since the VIC only has 22 characters per line. The values of C and S in line 500 indicate the number of accounts in checking and savings respectively. The total number of all accounts (A) is computed from these two numbers (A=C+S).

When run, the program displays each account total along with the current checking and savings balances for fast and easy verification. Each transaction is entered by selecting the appropriate account number and the value to credit (+) or debit (−) the specified account. Positive values indicate deposits while negative values indicate expenses or bills

paid. You can even transfer funds from one account to another. Simply enter T for transfer followed by the account numbers of the accounts involved and the amount to transfer. The actual transactions are not recorded, only the running totals for each account. Remember that this was supposed to be a simple budget program.

An account total can become negative if expenses exceed current funds allocated for that expense. This effectively indicates "borrowing" money from other accounts and should be corrected by transferring money from another account if possible. Otherwise you might want to reconsider the pay deposit value if a particular account consistently goes negative. On the other hand, a negative checking or savings balance would indicate an overdrawn account and should be avoided.

One other very nice feature of this program is the ability to set the amount to be credited to each account for a paycheck deposit. Thus, come payday, you simply enter the amounts to be deposited to checking and savings and the program does the rest. Because of this feature, the last checking account must be the MISC account and the last savings account must be the SAVINGS account. The amount to be deposited from pay to each account is specified in lines 200 and 250 with a zero value shown for the MISC and SAVINGS accounts. These accounts automatically get any remainder from the pay deposit after all the required deposits are made to the individual accounts. If the pay deposit is not large enough to meet the required budget totals for checking and savings, the difference is subtracted from the MISC and/or SAVINGS accounts.

Since we are going to save the data within the program, we must define storage for the values in data statements. Line 10 contains the initial values for the checking accounts and line 20 is for the savings accounts. Separate data statements were used for checking and savings to allow easy addition or deletion of accounts as required. These lines must be the first two lines of the program for the POKEs to work correctly.

All values are kept internally as whole numbers by multiplying each value by 100. This helps avoid decimal points and problems associated with fractions in Basic computations, besides making the data easier to save using POKEs. With six digits per field, the limiting values for any account value are −999.99 to +9999.99 since the minus sign takes up one digit space for negative numbers.

To customize the program for your own use, simply set the correct values of C and S in line 500. Then add or delete the required data fields in lines 10 and 20. You should have one field of six zeros for each account, with a separating comma. Do not add any separating spaces! Then add or delete the account names in lines 100 and 120. Change any names as desired but keep each to a maximum of nine characters.

Now set the PAY deposit values for each account in lines 200 and 250 by taking into consideration the related expenses and frequency of payment. Remember to keep the MISC and SAVINGS accounts as the last accounts in the checking and savings, with zero pay deposit values for each. Individual accounts can be added or deleted at any time by making similar changes. Just don't forget to get an account value to

```
10 DATA000000,000000,000000,000000,000000,000000,000000
20 DATA000000,000000,000000,000000,000000
30 :
35 REM *** ABOVE LINES MUST BE FIRST 2 LINES OF PROGRAM ***
40 :
50 REM ACCOUNT NAMES FOR CHECKING
100 DATA CHARGES,"AUTO EXP",MORTGAGE,PHONE,UTIL,LOAN,MISC
110 REM ACCOUNT NAMES FOR SAVINGS
120 DATA "AUTO INS","FIRE INS","LIFE INS",XMAS,SAVINGS
200 DATA 25,40,140,15,50,40,0 : REM CHECKING PAY DEPOSITS
250 DATA 30,10,20,15,0        : REM SAVINGS  PAY DEPOSITS
290 :
300 REM ********************************
400 REM C = #ACCOUNTS IN CHECKING
410 REM S = #ACCOUNTS IN SAVINGS
420 REM A = TOTAL #ACCOUNTS
430 REM M(.) = MONEY VALUES
440 REM N$(.) = ACCOUNT NAMES
450 REM CB = CHECKING BALANCE
460 REM SD = SAVINGS ON DEPOSIT
490 REM ********************************
495 :
500 C=7:S=5:A=C+S:DIM M(A),N$(A):CB=0:SD=0
510 FOR X=1 TO C:READ M(X):CB=CB+M(X):NEXT
515 FOR X=C+1 TO A:READ M(X):SD=SD+M(X):NEXT
520 FOR X=1 TO A:READ N$(X):NEXT
530 L$="......... ":REM ← 9 PERIODS & A SPACE
540 :
550 REM ************************************
560 REM LISTING NOTES:
565 REM "□" = CLEAR/HOME
570 REM "□" = CURSOR UP
575 REM "■" = CURSOR LEFT
580 REM "■" = REVERSE
585 REM "■" = REVERSE OFF (SHIFT REVERSE)
590 REM ************************************
595 :
600 PRINT"□";:C2=0:S2=0:FOR X=1 TO C:V=M(X):GOSUB 900:NEXT
610 PRINT:PRINT"    ■TOTAL CHK $";:V=CB:GOSUB910:PRINT
620 FOR X=C+1 TO A:V=M(X):GOSUB 900:NEXT
630 PRINT:PRINT"    ■TOTAL SAV $";:V=SD:GOSUB 910:PRINT"↑"
640 PRINT"└ ACT# ■P■AY ■T■RANSFER"
645 REM   ↑↑ SHIFT - AND SHIFT @
650 INPUT"   OR ■D■ONE";A$:X=VAL(A$):IF X>0 AND X<=A THEN 800
660 IF LEFT$(A$,1)="T" THEN 810
670 IF LEFT$(A$,1)<>"P" OR (C1<>0) THEN 1000
680 PRINT:INPUT"CHK DEPOSIT";C1:INPUT"SAV DEPOSIT";S1
685 C1=INT(100*(C1+.001)):S1=INT(100*(S1+.001))
690 FOR X=1 TO A:READ V:V=V*100
695 IF X=C THEN V=C1-C2:PRINT"□PAY DEPOSITS TO...":PRINT:PRINT:GOSUB 900
700 IF X=A THEN V=S1-S2:PRINT:PRINT:GOSUB 900
710 GOSUB 950:NEXT:PRINT:PRINT:PRINT"<<<  HIT ANY KEY  >>>"
720 GET R$:IF R$="" THEN 720
730 GOTO 600
800 PRINT:INPUT"   +/- $AMT";V:V=INT(100*(V+.001)):GOSUB 950:GOTO 600
810 PRINT"□□                    ":REM ← 2 CURSOR UP + 21 SPACES
812 PRINT"                     ":REM ← 21 SPACES
815 INPUT"□□├ FROM ACT#";A$:N=VAL(A$):IF N<1 OR N>A THEN 600
816 REM    ↑↑ 2 CURSOR UP, SHIFT + AND SHIFT @
820 INPUT"└── TO ACT#";R$:X=VAL(R$):IF X<1 OR X>A THEN 600
825 REM   ↑↑ SHIFT - AND 3 SHIFT @
830 PRINT:INPUT"     $AMOUNT";V:V=INT(100*(V+.001)):IF V<0 THEN 600
835 REM          ↑ 5 SPACES
840 GOSUB 950:V=-V:X=N:GOSUB 950:GOTO 600
900 PRINT RIGHT$(STR$(X+100),2);" ";N$(X);RIGHT$(L$,11-LEN(N$(X)));
910 PRINT RIGHT$("    "+STR$(INT(ABS(V)/100)*SGN(V)),4);
912 REM              ↑ 4 SPACES
915 IF V<0 AND V>-100 THEN PRINT"■■-0";
920 PRINT".";RIGHT$(STR$(ABS(V)+100),2):RETURN
950 M(X)=M(X)+V:IF X>C THEN SD=SD+V:S2=S2+V:RETURN
960 CB=CB+V:C2=C2+V:RETURN
1000 IF LEFT$(A$,1)<>"D" THEN 600
1005 REM POKE NEW VALUES INTO DATA STATEMENTS OF LINES 10 & 20
1010 N=4102:FOR X=1 TO A:L$=RIGHT$("      "+STR$(M(X)),6)
1020 REM CONSTRUCT 6 CHAR STRING,    ↑ 6 SPACES
1030 FOR Y=1 TO 6:POKE N,ASC(MID$(L$,Y,1)):N=N+1:NEXT
1040 N=N+1:IF X=C THEN N=N+5
1045 REM EXTRA 5 IS ADDED AFTER CHECKING ACCOUNTS
1046 REM TO STEP OVER END-OF-LINE FLAG, LINE NUMBER, AND LINK
1050 NEXT
2000 PRINT"□REWIND TAPE":PRINT"AND SAVE PROGRAM"
2010 PRINT:PRINT"TO RETAIN NEW DATA !":PRINT:PRINT
READY.
```

Program listing. VIC Budget program.

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zero by transferring any money to other accounts before deleting the account. This will keep your checking and savings balances correct.

The program listing has a number of remark statements to help document the program. If you should decide to use the program, please don't bother entering these lines. They'll only make the program loading and saving much longer, just what we wanted to try to avoid. Once typed in, a few minutes experimenting with the program should clearly indicate how it works. Enter a few transactions, then type D (for done) and list lines 10 and 20 to see what was saved within the program. If you have any problems, check for extra spaces in lines 10 and 20 or check the POKE address in line 1010. Remember that N=4102 only works with the basic VIC; it must be changed to N=1030 if you have the expansion memory or are using the program on a standard PET/CBM system.

This whole program was originally used to illustrate the idea of saving data within the program itself. The basic theory is to include data statements in the program with initial data specified for the first time the program is run. The data statements and their associated data define space within the program for the data that is to be saved after each time the program is run. Before terminating, the program simply pokes the new values to be saved back into the data statements to replace the original data.

The entire program is then saved after each execution and the latest data is automatically included without any special actions by the user. Whenever the program is loaded, the previous data is readily available using the standard read command of Basic. Saving data using this method is extremely simple, but it does require knowing the format of Basic lines stored in memory.

For those newcomers to the Commodore world and Microsoft Basic, here's a quick overview of the structure of your Basic program in memory. Quite simply, each line consists of two bytes containing the line number converted to a 16-bit hexadecimal quantity, a two-byte link or address pointer to the start of the next sequential line of the program, the actual text of the Basic line, and a one-byte end of line flag (a zero value). The actual text of each line is compressed, with each Basic keyword replaced with a single byte token representing the corresponding Basic keyword.

Your Basic program starts at location 4097 on the VIC-20 without any expansion memory. With the memory expansion, or on a standard PET/CBM, the program actually starts at location 1025. So, looking at line 10, the two-byte line number starts at 4097 followed by the two-byte link and the data token. Thus, the first digit of the first data field is stored at location 4102 on the VIC-20. This is how the correct value for N (line 1010) was computed.

When the data is poked back into the data statements it must be converted to a character string of the same length as the data field in the data statement. This is done in line 1010 by taking the RIGHT$ of the value string concatenated to a string of spaces. This guarantees a string of exactly six characters in length, with any necessary leading spaces added. The entire six-character string is then poked back into the data statement in line 1030 to erase any previous data as well as storing the new data.

Each time a character is poked back into the program, the pointer (N) is incremented accordingly. Note, however, that after completing the checking accounts (when X=C) another 5 is added to the pointer N. This corrects the pointer for the fact that another program line is used for the saving accounts. The additional 5 accounts for the end of line flag in line 10 and the two-byte line number and two-byte link in line 20.

If you should use this technique of saving data within your own program, don't forget it can be used to save strings or numbers. Be careful you don't destroy the data statement itself or the separating commas when poking characters into a data statement. Also, don't forget the extra bytes between program lines. Each field definition must reserve enough space for the longest length expected to be encountered by the program. Numeric values must be converted to strings before being saved. Quotes should be used at the beginning and end of each field when saving text strings.□

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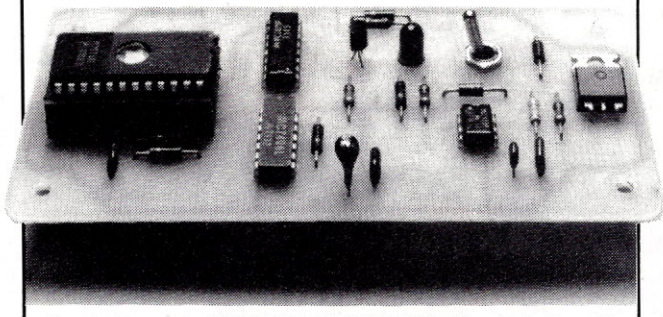
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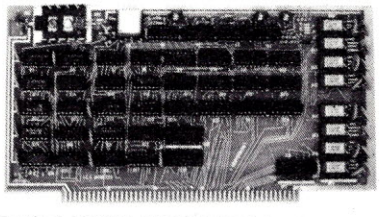
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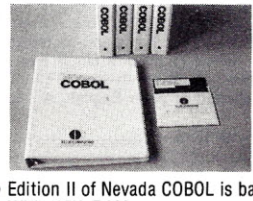
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By Frank J. Derfler, Jr.

Moving Files Made Easy

With Smart Terminal Programs

In this month's Dial-Up Directory, we will examine the ways in which files can be transferred between microcomputer systems. In the process, I will describe an interesting (and inexpensive!) new smart terminal program for the TRS-80 Models I and III called Modem 80. But first, let's look at a communicating game from Adventure International called COMMBAT.

Blasting Bits

Playing games against a computer is one way to enjoy yourself, but playing against a flesh-and-blood person adds several dimensions of strategy and skill that are difficult for a computer to match. Bob Schilling has written an interactive real-time war game for two physically separated players called COMMBAT. This two-system war game is being released through Adventure International.

The best part of this program, from my point of view, is that versions of the software are being released for the TRS-80 I/III and Color, the Atari, the Apple II, and later the Commodore VIC and possibly the NEC. The game will run on disk or cassette machines. This means that two players, equipped with any two of these computers and connected by modems and telephone lines, can play a real-time game across town or across the nation. (They could also play across the room if they were connected by an RS-232C cable.)

Since the same program is running on both machines, playing time is not taken up by the transmission of complete screens of information. The program only has to transmit status messages between the systems to update the displays. The usual sector map and status boards are available along with a wide selection of weapons and strategies.

The significant difference between this and other games of weapons and maneuver comes from the presence of the "other" human, who is only known through his or her strategy and tactics. The game is most interesting for evenly matched players.

> Transferring files on a disk is only simple if the machines and operating systems are identical.

COMMBAT is available from Adventure International, 507 East St., Box 3435, Longwood, FL 32750. (Order phone 800-327-7172.) The cost ranges from $19.95 to $24.95, depending on the medium and machine.

This program provides an excellent example of the ability of the data communications port to serve as a common link between different computers regardless of their power or design.

Moving Files

People want to transfer files of information from one computer to another for many reasons. Authors transfer stories to their publishers, businesses transfer orders and accounting information and programmers transfer programs for sale or development.

The simplest way to transfer files is to carry them on a floppy disk. This is practical when a standard disk format is used, like the eight-inch single-density disk commonly used to transfer CP/M programs and files. But, as so many of us know, the kinds of disk formats and disk drives in use vary widely—particularly in the world of 5¼-inch disk drive systems.

Not only are machines from different manufacturers completely different, but even the same model machine from a single manufacturer may not read disks formatted under different versions of the operating system. Obviously, the simple method of transferring files on a disk is only simple if the machines and operating systems are identical. But there are other ways to get the job done.

The data communications ports of almost all microcomputers (except Commodore) use RS-232C signaling and the ASCII data alphabet. The data communications port provides a good way of transferring file information because the received and transmitted information is not influenced by the kinds of drives, the size of the disks, or the operating system in use.

But to transmit and receive data to and from the disk system, you need a special program. This program not only allows the computer to act as a terminal (displaying the received and echoed data); it also allows the computer to exchange information to and from the communications port, system RAM and the disk drives. A program like this has to do a lot of buffering, initializing and interacting with the operating system which is never seen by the operator. Hopefully, all the operator sees are simple displays and easily understood operating-system messages.

Common File Transfer Programs

The most common file-transfer programs are those meant for the exchange of ASCII text. They capture all of the data entering the communications port and save it into a disk file. A word-processing program can be used at a later time to clean up any stray words (such as prompts or operator messages from the other system) that might have been captured along with the desired text. This kind of ASCII text file can stand an occasional garbled character caused by noise on the telephone line or other interference.

The best of these text transfer programs have several nice features. They often will move the data through the RAM in blocks so that disk files larger than the available RAM size can be created. This is useful when the disk will be used on a larger, but otherwise identical, system. These programs will often allow for opening and closing the receive buffer with a single keystroke while the pro-

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gram is on-line. This allows the operator to easily pre-edit the received data.

In the transmit mode, most smart terminal programs will respond to prompts from the distant receiving system which tell the transmitting microcomputer when the receiving system is ready to take the next character or line. They will also usually allow for some control over the speed of the characters being sent—not in terms of the actual transmission speed, each character is still sent at the standard speeds of 110, 300, 600 or 1200 bits per second, but in terms of throughput, so that the transmission and receiving systems do not become overloaded.

Some programs have some very special features. ST80 III, written by Lance Micklus, will compare each transmitted character with its echo. If they differ it will display a trouble message. At this point, the operator can only choose between going on and aborting the operation.

Omniterm, written by David Lindburgh, offers a slightly more accurate method of determining if a file has been received correctly from another Omniterm-equipped machine.

An Omniterm utility program translates any file into a special bit-packed format with checksums at the end of each line and a sum of all checksums at the end of the file. It will detect any errors in a file received from another Omniterm system, but it does nothing about correcting those errors.

Error Detection and Correction

This kind of file transfer capability is good enough for ASCII files and it will often work with program files when the telephone circuits are of high quality. But many people who transfer binary files, machine-language program files, or files of financial data need 100 percent accuracy in their file transfer programs. One error can result in programs that will not run or serious mistakes in business statistics. These people need both error detection and automatic error correction in their smart terminal programs. Several programs available under the CP/M operating system perform this kind of reliable file transfer.

CP/M Block Transfer Programs

A program is available in the public domain called "Modem" which provides for automatic error detection and retransmission of the incorrect data until it is transferred correctly. The Modem program was originally written by Ward Christensen (one of the developers of the first successful CBBS) and is on the CP/M User's Group disk number 25. Modem breaks files into 128-byte blocks. Each block is transmitted along with a numerical checksum that allows the receiving program to compare the value of the checksum for each block with the block value sent by the transmitting program. If the value is not the same, the program retransmits the block until it is correct—although it usually is set to stop after the tenth try.

Modem 80 is an uncommonly capable smart terminal program at a very low price.

Clink

Another widely used program has a slightly different protocol which it uses for file transfer. Clink was written by Larry Hughes in 1978. Larry now estimates that over 5000 copies of the program are in circulation, although he hasn't released it into the public domain. Larry claims that this gives his program the dubious honor of being one of the most stolen pieces of software in the field.

Clink uses blocks of data which are 256 bytes long or greater. It operates under the same general concept as Modem and other protocol file transfer programs in that it will retransmit the block when it detects an error. The cyclic redundancy check system used by Clink is statistically more certain to produce 100 percent reliable copy than the checksum system used in Modem.

Clink is a command-driven program (as opposed to the more common menu-driven programs). An updated (legal) version of the program is available from Mycroft Labs, PO Box 6045, Tallahassee, FL 32301, for $75. Version 3.5 includes a number of bug fixes and new features such as control-Q/control-S handshaking for the transmission of large data files.

The Crosstalk program from Microstuf, which has been reviewed before in this column, is completely compatible with the Clink file transfer protocol. A new version of Crosstalk should be available by the time this article is published which has many special operating features. By the way, Microstuf, Inc., has moved across town in Atlanta. They are now at 1900 Leland Drive, Suite 12, Marietta, GA 30067.

Another file transfer program operating under CP/M is called COMMX. It is a very good menu-driven program which will receive a more thorough review here in the future. COMMX uses a 128-byte block, but it uses seven-bit bytes. This unique feature allows the program to be used on time-sharing networks, and local networks such as Xerox's Ethernet, which will pass only seven-bit data. The COMMX program is available for $75 from Hawkeye Grafix, 23914 Mobile St., Canoga Park, CA 91307.

Out of all of these programs, only Clink and Crosstalk use a common protocol error detection and correction scheme. All of the other programs can only exchange files with computers equipped with another copy of themselves. Until the development of the next program we are about to see, users of non-CP/M computers had no way to exchange data files using reliable statistical error detection and correction techniques.

Modem 80

Modem 80 follows the Modem protocol, but operates on the TRS-80 computer. Written by Leslie Mikesell, it is a complete smart terminal package available on TRS-80 Model I disk format. I've used the program for several weeks and I'm very pleased with most of what Leslie has done.

Anyone with a single disk drive TRS-80 Model I/III should know by now that he will have trouble using many of the programs available from non-Tandy sources. The TRS-80s need to have an operating system disk available seemingly every time the disk turns, and outside sources are not allowed to supply their software on a system disk. If you don't have a two-drive system, you need a friend with one. Modem 80 easily changes into a Model III program by the use of the Convert utility on a two-drive system.

The program has two main features—its protocol file exchange capability and its price. The protocol file exchange portion of the program will let you exchange files with either a CP/M computer running Modem or another TRS-80 running Modem 80. The Modem 128-byte block protocol described above is used. This program should answer the wishes of many serious TRS-80 users. At $39.95 (+ $2 shipping), it's a steal.

Modem 80 has several other unique features. A single-key command lets you transmit one line of a file at a time. This means that you can load *all* of your sign-on codes into a single file once, and then transmit them one-by-one in response to the prompts from the system you're using. In many programs with an automatic transmission function, you have to put in nulls where you expect the system prompts to come, and hope that the nulls are equal to or longer than the delays in the time-shared system. Usually, they aren't.

Modem 80 also lets you have both a file for transmission and a file for reception available simultaneously. This means you can prowl through bulletin boards quickly. You can easily capture those messages you want to save (using the nonprotocol data capture feature of Modem 80) and just as smoothly leave messages you've prepared without leaving the on-line mode to open and close files from some local menu selection.

Modem 80 has other features, such as

the ability to both transmit and receive files larger than the available RAM. The program designates the number keys at the top of the keyboard as special function keys when they are used with the clear key. These special function keys allow the user to do things like toggle the printer off and on and open and close the capture buffer without leaving the online mode. Modem 80 has some valuable menus, but the most commonly-used features are available from the online mode.

The program is designed for 300-bps operation. It can operate at 1200 bps if you don't have to scroll the screen. A special patch on the disk will allow the program to operate with full features at speeds of up to 2400 bps with the LDOS operating system on the TRS-80 Model III.

Modem 80 contains other advanced features, such as four separate translation tables which can be used to filter and convert characters going out the communications port, to the display screen, to the disk file and to the printer.

The instruction manual is packed with information. It includes a glossary and detailed descriptions of the RS-232C signaling scheme and control codes. Unfortunately, the information is not well-organized, and there is no index and a very skimpy table of contents. The subjects are not introduced very smoothly, but once you find out where you are, all the information that you need is in the book.

In short, Modem 80 is an uncommonly capable smart terminal program at a very low price. But that ain't all. Along with Modem 80 and all of its utility programs, Leslie has included a program he calls Host1.

Host1 turns any TRS-80 Model I or III—regardless of the DOS—into a remote operation system. It allows users to dial into your auto-answer modem and use your computer to run, load or transfer data. The protocol file transfer subprogram can be run by itself so that remote users can perform a complete unattended transfer of files with a high assurance of accuracy.

Host1 doesn't have any fancy protection schemes or passwords, but remember, this program is a "freebie" with a communications package that only costs $42 in the first place. Go ahead and bury Leslie with your letters and certified checks. Order Modem 80 ($39.95 + $2 shipping—no credit cards) from Leslie Mikesell, 32466 SR541, Walholding, OH 43843.

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Professors Take Plunge

Lease/Purchase Program Catches On At Hampshire

Micros and the Liberal Arts

Can computer science and the liberal arts find true happiness together? At Hampshire College in Amherst, MA, the answer is a resounding "yes."

At first glance, Hampshire is the last school on Earth where you would expect to see an interest in computers. Founded in 1970 by Amherst, Mount Holyoke and Smith Colleges and the University of Massachusetts, Hampshire is an experimental, open-concept school. Its 1250 students devote their time to independent studies and self-designed projects, in courses with such titles as Gods, Beasts and Mortals: The Beginnings and the End of Political Theory, Exploring the Winter Woods, and Natural Habitats of New England.

But Hampshire is in the throes of what one faculty member calls "a kind of mania" for computers. At least 15 of 100 faculty have acquired Apple microcomputers through a special college lease/purchase program. And one professor estimates that as many as one-quarter to one-third may have machines.

The craze took hold last summer when a campus workshop introduced micros to a number of faculty.

"The workshop triggered an astonishing number of people on the faculty to decide that they wanted to own one of these things," says Richard Muller, a professor in the school of language and communication. People from a variety of disciplines—history, psychology, literature, chemistry, biology, music, and communications—have joined in.

The lease/purchase program is simple. The faculty member requests the computer, and the college buys it. The professor puts down one-third of the system's cost, with two other payments due over the next two years. When the final payment is made, Hampshire College turns the computer over to the professor.

Many faculty have a very practical reason for buying a micro—word processing. Because Hampshire largely eschews grades and exams, faculty do an enormous number of written project evaluations. This, says Muller, has created "a big paper flow problem."

Hampshire is in the throes of what one professor calls "a kind of mania" for micros.

"Almost everybody got an MX-80 printer with their systems," Muller says. "The proportion of memos and paper being generated on micros is becoming noticeable."

But micros are also playing an important role in Hampshire's curriculum, particularly in the school of language and communication. The school includes a cognitive science program, which combines linguistics, computer science, analytic philosophy and cognitive psychology to study, says school literature, "not only how human minds function, but also the thought processes of animals and computers." The program places special emphasis on computation theory and artificial intelligence.

But Hampshire's liberal arts tradition remains in evidence; the computer craze is sobered by heavy doses of skepticism.

"We have the excitement, but we also have an 'I'm-from-Missouri' attitude," says Bill Marsh, dean of the school of language and communication. The college does not take a "computer groupie" approach typical of business and technical schools, he says.

"Hampshire is in the position of being able to provide other perspectives on such subjects as the history of technology, the impact of technology on society, and the role large corporations play in America and the world," he says.

Muller concurs: "A number of us arrived at the conclusion—although this may be slightly overstated—that we're looking at something as important as Henry Ford putting cars on the assembly line." It's important, he says, that people in the liberal arts learn about computers, and become involved in public policy-making.

"It should not be left to a previously-defined technological elite," he says.

Computer Generated Fiction

The editors of *Omni* magazine touted "Soft Ions" as "the first experiment in computer-generated science-fiction writing." But is the story, which appeared in *Omni's* December 1981 issue, an example of artificial intelligence?

No, says William Chamberlain, who co-wrote with Thomas Etter the Racter program that wrote the story.

"This does not think, nor does it replicate thinking vis a vis the artificial intelligence work being conducted right now," he says.

The program runs on an Ohio Scientific Challenger II with 48K bytes of random-access memory. Chamberlain says that it "can compute character strings which we recognize as being English and to which we give meaning."

The program differs from AI experiments because it doesn't apprehend anything outside itself, he says. "It's doing its thing inside."

Chamberlain, 41, admits he is only a dabbler at computer programming. "I'm quite a dilettante at this," he observes, "but I've learned a lot over the past four years working on this project."

Born in the Chelsea section of New York City, Chamberlain has penned short stories, tv scripts and pulp fiction. He has made blue movies, as well as medical films for the University of California Medical School at Berkeley and the University of Minnesota Medical School.

According to Chamberlain, his part-

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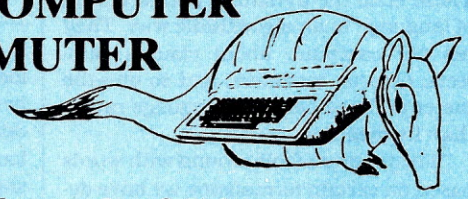
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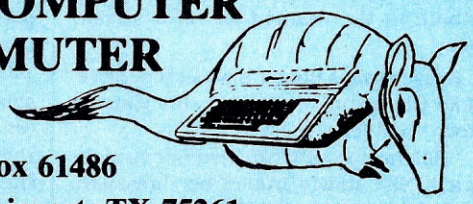
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ner, Thomas Etter, has 20 years' experience with computers and holds patents in the field. Etter, who lives in California, is a quantum logician and systems designer.

How It Works

The program, Chamberlain says, is composed of dictionary files—made up of lists of words—and hierarchic files. These echo the dynamics and structure of language in an algorithmic way. They tell the computer about clauses, subjects, objects, modifiers, and so on—the meter and resonance of language rather than its meaning.

"The program fools around with words based on certain formalisms we have decided upon," he says. "The most important one, of course, is what formalisms one can extract from the English language.

"Once you've extracted certain shapes and forms and thrusts and parries of English, and then given the computer some English words, conjugations, rules for pluralizing things, and a way to keep track of gender, it is able to compute English."

Chamberlain says that words called identifiers define the relationships between words in the program. "Fur" could be an identifier, he says; the computer could be told that if it chooses the word "horse," it can use "fur" with it, but if it chooses "grand piano," it cannot.

"Now, if you simply expand upon that," he says, "and make it more and more intricate and more and more complex, you will see that the computer can compute some very interesting things in the English language with nothing but a long list of identifiers to make choices from."

Even though Racter has produced one story, Chamberlain and Etter are not ready to churn out more. Chamberlain says bugs in Racter and hardware limitations keep another unique story from being produced. "If you started the program now," he says, "the stories would be similar."

All the files can't be loaded into the OSI's memory at once, he says, so the choice points in the program are limited. So is what Chamberlain terms "depth of call"—the distance the program may depart from the point before returning to it. Racter has a depth of call of six to seven, he said, another factor that would contribute to the "sameness" of a second story.

It also makes Racter's prose repetitive. Note the use of "braid" in this passage from "Soft Ions":

"Helene speedily brushed her straight braid. She slowly ironed her brassiere, and John, aloof, dazzling John, commenced singing quizzically. Matthew yearned to look into Helene's nightgown while Wendy pondered her dreams (maniacal leopards were swallowing loony oboists). Helene started brushing her braid: She was a maid, much to John's happiness, but oboists, even loony oboists, weren't in Helene's brain; she was simply commencing to comb her braid after brushing it and prepare for supper."

She was a maid, but oboists, even loony oboists, weren't in Helene's brain.

Also, Racter only works on the OSI, which limits its portability. The pair have purchased new hardware but are having a difficult time adapting Racter to it.

"As it stands now," Chamberlain observes, "it is a very buggy program. It takes an immense amount of idiosyncratic knowledge to get the thing working properly.

"We have some limitations that are very hard to get at and each of us has other things to do to make a living. We can't spend our time exclusively on this activity."

Omni helped Chamberlain and Etter with a substantial initial problem with Racter: translating it into machine language. "It was running too slow in Basic," Chamberlain says.

No Future?

"If we don't get some money, there's not going to be any future," says Chamberlain. But he adds he hopes to publish a book of 13 computer-generated short stories written in a "very intriguing and new kind of expressive fiction."

He says computers will eventually be producing novels. They will "look different than anything a human being has ever produced," he says, but they "could never have the mystery of writing.

"It could write junk novels," he adds. "I think that's a possibility, although my colleague and opposite number, Mr. Etter, thinks that is not the case."

However, he said, "I don't think a computer will ever write literature."

Asked if "Soft Ions" reflected his writing style, Chamberlain says, "Many people that know me have said, 'Wow, Bill, it's saying crazy things, we don't understand it, but it sounds like you.'

"The computer somehow seems to sound the way the person who has written the files sounds, regardless of what the computer is saying. If this is indeed the case, then this particular program in some sense captures some aspect of a living person.

"Had Oscar Wilde started out with this computer and got some aspect of himself in it on a disk, then we could have Oscar Wilde talking to us now. It wouldn't be reasonable talk, but it would be ever changing and be some aspect of Wilde.

"That may be one of the most important things such programming can do, and there's no other modality around these days that can afford us that."

Informatics the French Way

This article is adapted from "Informatics in French Secondary Education: The '10,000 Microcomputers' Project" in the October-December 1981 issue of Agora *magazine, published by the Intergovernmental Bureau for Informatics in Rome, Italy.*

Last September, students in the third to last year in a dozen French lycees equipped with microcomputers were given the option of studying informatics as a regular subject. This began a new and important phase of the "10,000 Microcomputers" project, which will include the in-depth informatics training of 200 teacher-volunteers and the installation of microcomputers in 200 lycees during this school year.

The origins of the project go back to the Informatics and Education international symposium at Sevres in 1970, which recognized the importance of introducing informatics technology into secondary schools as an aid to teaching other subjects.

At the time of the Sevres symposium, Mr. W. Mercouroff, then responsible for informatics in the Ministry of Education, described informatics as "the science of information processing . . . characterized by the advance of new modes of thought (model-based, algorithmic and organizational).

"Because it is an element of common culture and in order to awaken students to this advance in thinking, informatics must be introduced into secondary education, but without creating a supplementary subject. To do this, informatics will be used in teaching traditional subjects. It is not a question of training informaticians, but of enriching general education."

An Informatics Experiment

From 1970 to 1976, the government carried out an experimental project dubbed "58 lycees," in which 58 schools received minicomputer systems. The project was especially remarkable for the ambitious way in which it provided informatics training for teachers.

Teachers participated in two training courses. The first gave 500 teachers one-year leaves to learn enough about informatics to train colleagues in both the educational uses of informatics and program writing. The second consisted of a correspondence course complemented by four two- to three-day training periods with a teacher who had already been

trained. By the end of the project, 5000 teachers had finished this second type of training.

The Ministry of Education found several important advantages to using informatics as a teaching aid.

First, they found that the computer encouraged logical thinking and coherence in students.

Second, they learned that the computer can appreciably enhance the knowledge offered to students. Students can use models previously impossible to create in a classroom.

Third, students learn to appreciate the advantages of a computer, and are no longer mystified by it.

Finally, the student-teacher relationship is improved. When a student needs help on a computer, he goes to the teacher, who has been freed to concentrate on slower students. The teacher demonstrates that he is superior to the machine, and the machine, in turn, becomes his ally.

The French government was particularly careful in its approach to introducing informatics technology into secondary education. The "58 Lycees" project, for example, involved less than 5 percent of the lycees in the country, and was given a full six-year trial period.

The New Project

Technological advances in the late 70s made equipment less expensive and more flexible, and caused the French government to reconsider its educational options in informatics. A new project designed in 1978 and 1979 took on the ambitious task of installing microcomputers in all of the country's lycees.

Already by the end of the first year of the "10,000 Microcomputers" project, 400 new microcomputers had been put into place. The budget for 1981 and 1982 alone is 250 million francs. According to the plan, 200 lycees per year will be equipped each with eight micros and one printer.

By 1987, the year in which the project should be finished, some 50,000 teachers will have had some sort of informatics training. And every lycee in France will be able to offer its students the use of informatics technology.

N.H. Educational Computer Week

The first week in May will be Educational Computer Week in New Hampshire.

"It is generally agreed that all students should become computer literate in order to function effectively in today's environment," reads the proclamation to be signed by N.H. Gov. Hugh Gallen.

Sponsored by the University of New Hampshire's department of computer services, the week's highlight will

By 1987, some 50,000 teachers will have had some sort of informatics training.

be an all-day Educational Computer Faire at UNH's Durham campus. The Faire, set for May 4, will feature current educational microcomputer software, and information on the educational uses of microcomputers (see the September 1981 *Microcomputing*, our annual education issue).

Educators and vendors will be there to discuss trends in educational computing, the value of learning computer programming as a method for training and other innovative ideas. Exhibitors will pay $100 for 12 × 12 foot booths.

"Educators are becoming more interested in computers and computer literacy," says Faire coordinator Anne Knight, the educational coordinator for the UNH department of computer services. Knight is also chairperson of the New Hampshire Association for Computer Education Statewide (NHACES). Her department at the University is acquiring information about educational software for distribution to New Hampshire school districts.

The department owns a TRS-80 Model I and some educational software, in spite of an infinitesimal microcomputer budget.

By spotlighting computers and education for the entire week of May 3–7, Knight hopes to engage the imagination of students and their parents to the potential of educational computing. And by involving the governor and the state news media through the proclamation of Educational Computer Week, she hopes to "make everyone at least aware that microcomputers are likely to be an exciting aspect of the educational experience."

Also planned for Educational Computer Week is an Information Swap, to be held at the Ramada Inn in Concord, NH. Sponsored by the NHACES, the Swap will be followed by dinner and a guest speaker. (Knight was narrowing down a long list of potential speakers as *Microcomputing* went to press.)

In addition, NHACES is encouraging local school districts to organize their own meetings to explore the educational uses of microcomputers.

(For more information, contact Anne Knight at 603-862-3527.)□

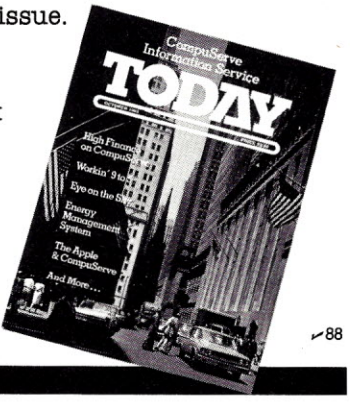
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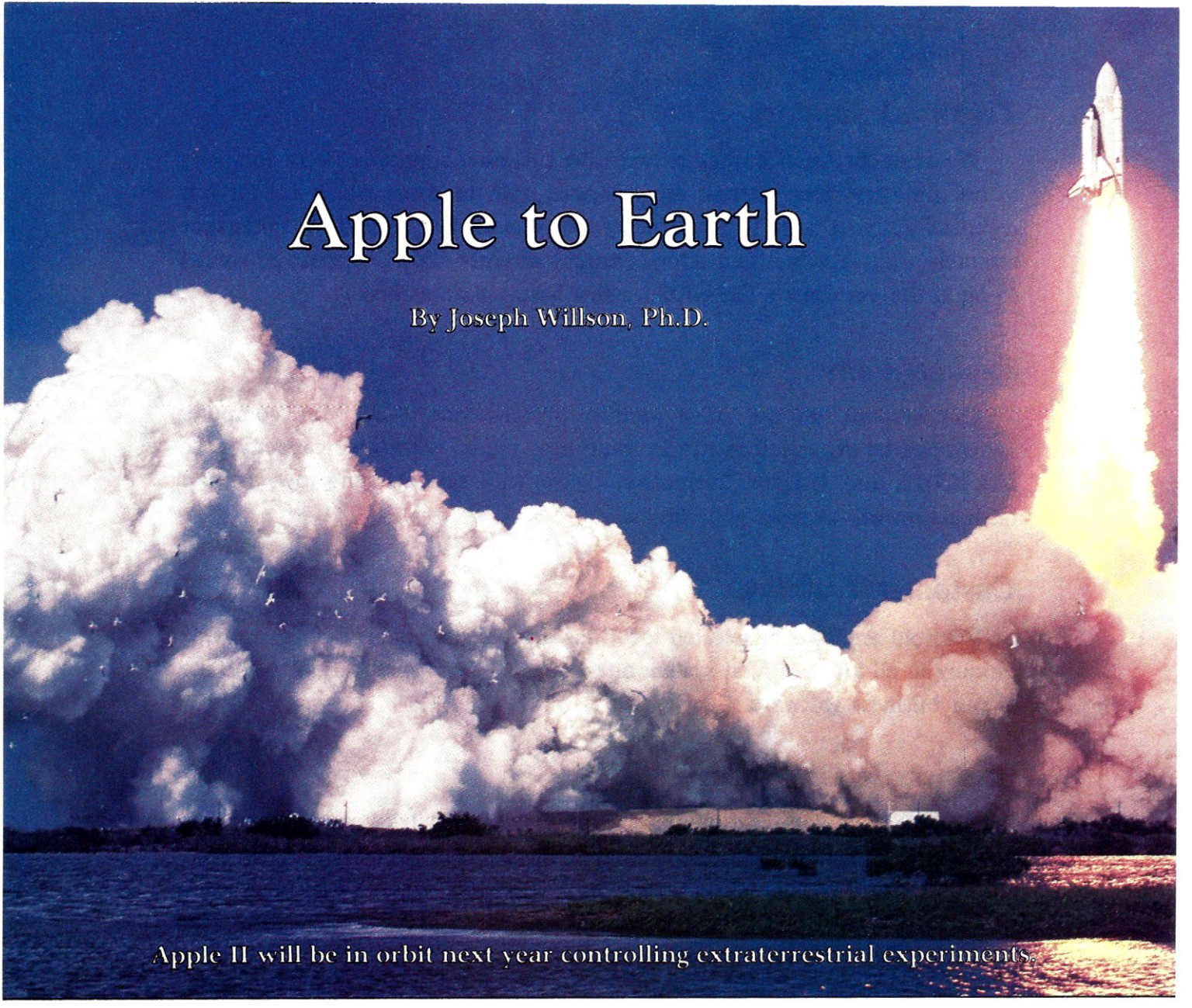
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Apple to Earth

By Joseph Willson, Ph.D.



Apple II will be in orbit next year controlling extraterrestrial experiments.

When a sunflower sprouts and begins to grow, it doesn't simply push its way straight up out of the soil—it moves in a spiral.

This process, called circumnutation, is common to many plants, and nobody is quite certain why. But researchers hope to get a better idea next year with Spacelab, a joint project of NASA and the European Space Agency. This compact laboratory will be carried into space by NASA's Space Shuttle. And on board, helping to control the experiment, will be an Apple II.

The story began in 1977 in the laboratory of University of Pennsylvania biologist Dr. Allan Brown. Brown is one of many scientists studying what factors affect plant growth. In particular, why do so many plants follow a helical path? Is it just an extraneous bit of behavior which entered by accident into the evolutionary process, or does it serve a purpose? How much do the forces of gravity come into play?

Brown focused his attention on the effects of gravity. But the study of gravity presents a problem in the lab. While a scientist can change the direction of the g-force by rotating the plant, he can never completely eliminate gravity itself.

It became clear that experiments had to be done somewhere other than in an Earthbound laboratory. NASA looked at the problem and agreed that this was, indeed, a prime example of an experiment which needed to be done in space. But one problem presented itself. Brown's experiment would require a precision centrifuge, video cameras and recorders, lighting, temperature regulation, and controlling electronics and instruments, and it would have to be condensed into a miniature self-sufficient package about 2×2×6 feet.

So the University asked Interactive Structures, Inc. of Bala Cynwyd, PA, to design, develop and build an experiment controller which would manage every aspect of a seven-day experiment aboard the shuttle.

Old Tech, New Tech

The conservative approach to development of experiment controllers and instrumentation in 1977 was to design custom circuit boards for the timing, control and measurement circuits, and to provide a generous helping of trimming adjustments and

Address correspondence to Dr. Joseph Willson, President, Interactive Structures, Inc., 112 Bala Ave., Box 404, Bala Cynwyd, PA 19004.

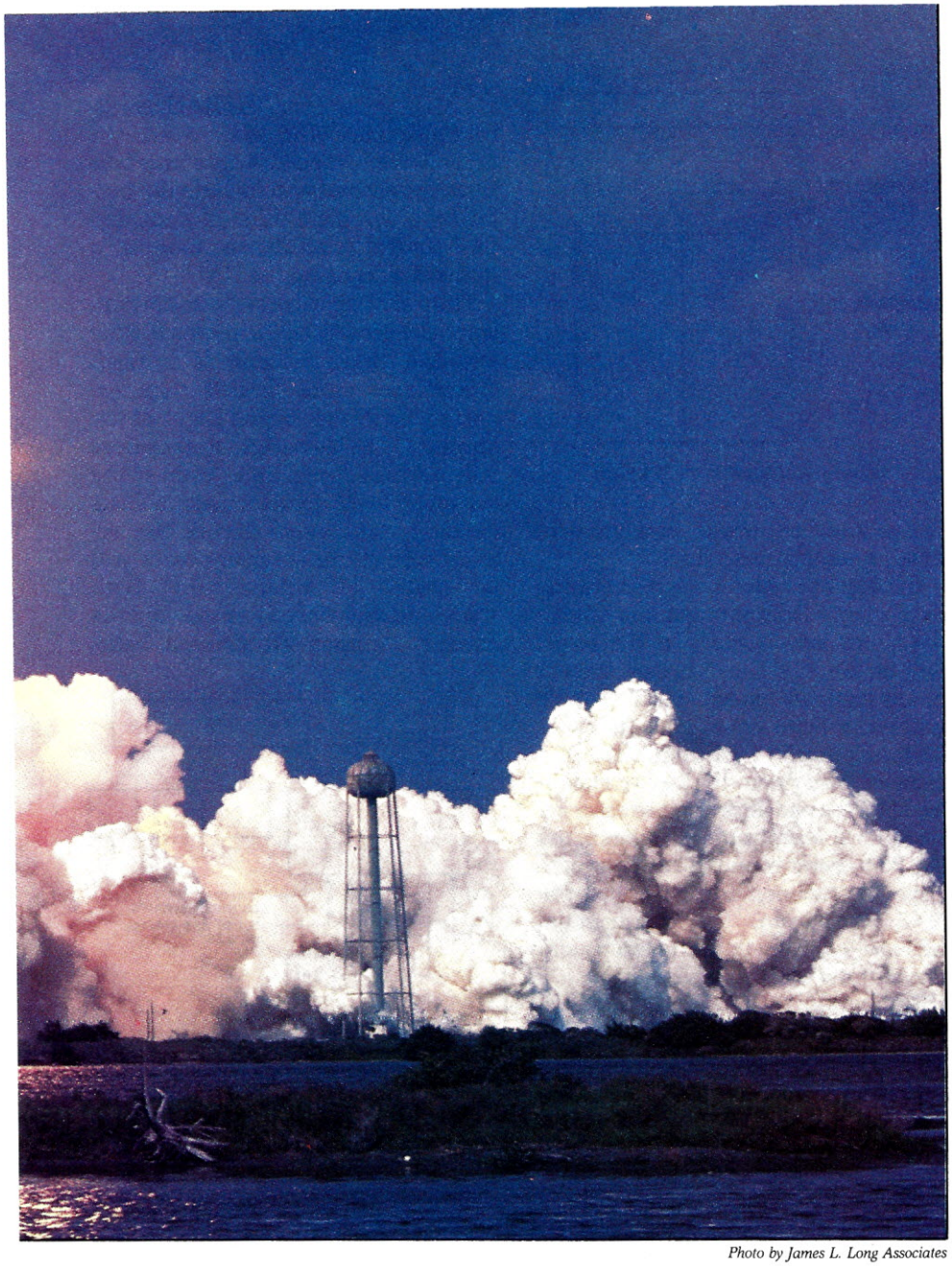


Photo by James L. Long Associates

oscilloscope test points for the unlucky engineer assigned to repair, or worse yet, to modify the system.

The company's experience with this technology showed that the only hope of meeting the size constraints and readying for the inevitable revisions was to look to the newly emerging technologies. In addition, NASA had directed the experiments should make use of existing technology and avoid costly custom development.

The slightly more-daring approach in 1977 was to go with one of the recently-introduced 16-bit single-board minicomputers. But that single board didn't include any way of getting the information in or out; it still needed a serial interface board and a complete video terminal just to determine if the machine was working. Putting together a system on which Interactive Structures could efficiently develop software and hardware involved a string of other expenses, starting with several thousand dollars just for operating system software.

In 1977, the microcomputer industry was barely off to a start. Several companies had marketed rectangular boxes with sets of switches and red lights on the front panels. Everyone knew the microprocessor was the coming thing but nobody knew just how soon or in what form. It would obviously have a place in the laboratory, but to go with one of these early arrivals seemed risky at best.

The Apple II was unique. No rectangular box, no switches, no lights. It really was a single-board computer, since the keyboard, video image generator and interfaces for future devices were all included. Rather than promising future add-in boards and add-on chassis for the memory, Apple included space for up to 48K of memory. When you turned it on, it spoke to you in Basic instead of binary. Why, these folks had even thought about interrupts and direct memory access data transfer!

Interactive Structures had evaluated these points in the context of general-purpose laboratory computing, and had already launched a family of interface boards which would connect the Apple directly to sensing devices and other lab equipment. For the NASA application, the Apple added up to a single device that could function as both a development system and as the eventual experiment controller itself.

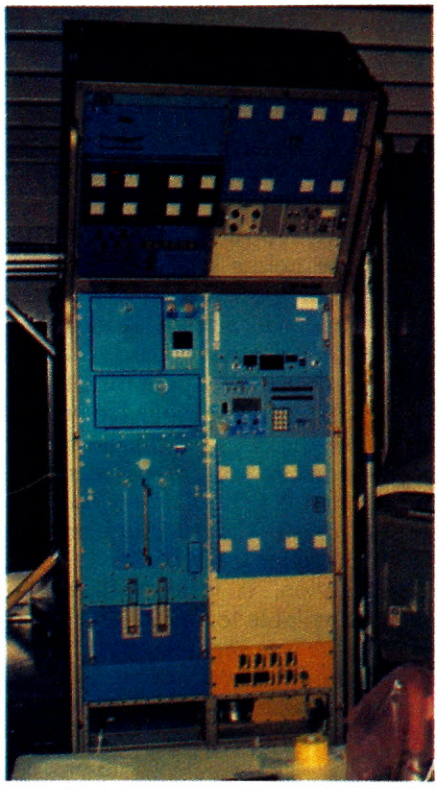
In addition, it was off-the-shelf, readily-available technology, just the type NASA was eager to show in use aboard the shuttle. An Apple II-based system became the experiment controller for the project.

The System

The system has a tough assignment. The hardware houses a stationary plant growth station and two miniature rotating precision centrifuges which will spin some of the plants and selectively re-create a gravity-like force (Fig.1). The speed of rotation must be held constant, since it will generate a force of 1 g. The motor selected will accept an eight-bit number from the controller to determine speed, and also return a series of pulses which the controller can monitor to verify that the speed has reached the requested value. These signals are interfaced using the company's bidirectional DI09 digital interface (Fig. 2).

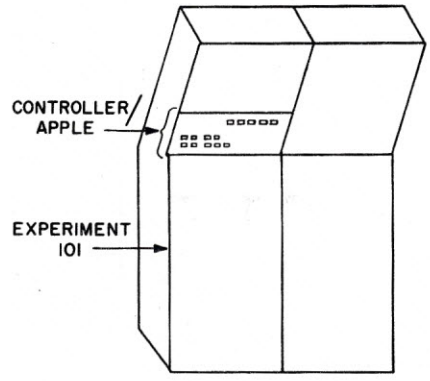
Three video cameras will collect pictures of the growth at regular intervals. Solid-state CCD array cameras were chosen since they are light, compact and sturdy. Infrared lighting will minimize any stimulus to the plant. The equipment will switch on only while recording to conserve power. The project decided on a conventional video cassette recorder, interfaced through its remote-control facility. The controller will select a camera and request a recording, and a modification will allow it to monitor the current in the recording head to verify that recording was taking place. The DI09 will switch cameras, recorders and lighting.

Temperature has to be monitored



Spacelab Experiment 101 enclosure, processor and AI02 interface.

and regulated so that it will not be a factor. A complete closed-loop temperature regulation system was designed for the three plant-growth areas. An integrated circuit temperature sensor in each chamber will produce a linear range of analog voltage indicating the temperature. Here, Interactive Structures used its AI02 analog input system to provide multiple channel analog-to-digital conversion (Fig. 3). The firmware will check the temperature against



Schematic of Experiment 101 photo.

the allowable range and control heating panels accordingly.

Certain operations, such as getting new plants from storage and inserting them into holders in the rotor, will be done by the operator, the onboard payload specialist (PS). The PS will use a front panel with indicator lamps for each of the controlled portions of the system to display experiment status and allow him to enter instructions. Membrane switches allow the PS to enter requests and acknowledge instructions from the controller. Here again, the bidirectional DI09 will handle both the lamps and the buttons with a single card.

Temperatures, speeds, video system operation and the PS's actions are to be logged for analysis after the experiment, so the experiment needs a one-way communication link. The project will use the shuttle's on-board remote acquisition unit (RAU), essentially another computer devoted to managing communications between the experiments and Earth (Fig. 4). The predefined format for communications is a serial scheme, clocked by a 1 MHz signal from the RAU, transmitting a burst of 16 16-bit words at a time. Here a special Apple interface is necessary and will include the buffer for a complete burst of data, and the control circuits to request a transmission using the RAU.

Time will be extremely important, since the growth of the plants is slow and the time in orbit is limited. (Sometimes more limited than expected, as in the second flight of the Shuttle.) The experiment therefore will need every minute, even if the system's 28-V power goes off accidently, and even during the reentry free-fall time when power will be turned off intentionally. Both space and weight are limited, and the essential components (camera, lights

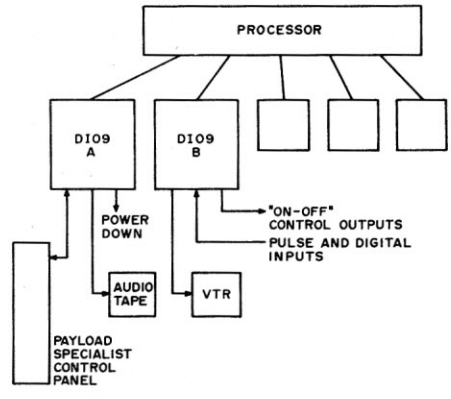


Fig. 2. Digital interfacing for the experiment.

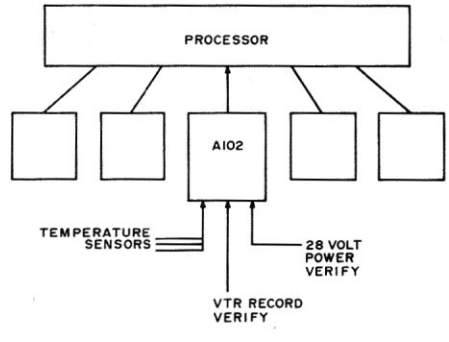


Fig. 3. Scheme of analog data acquisition from the experiment.

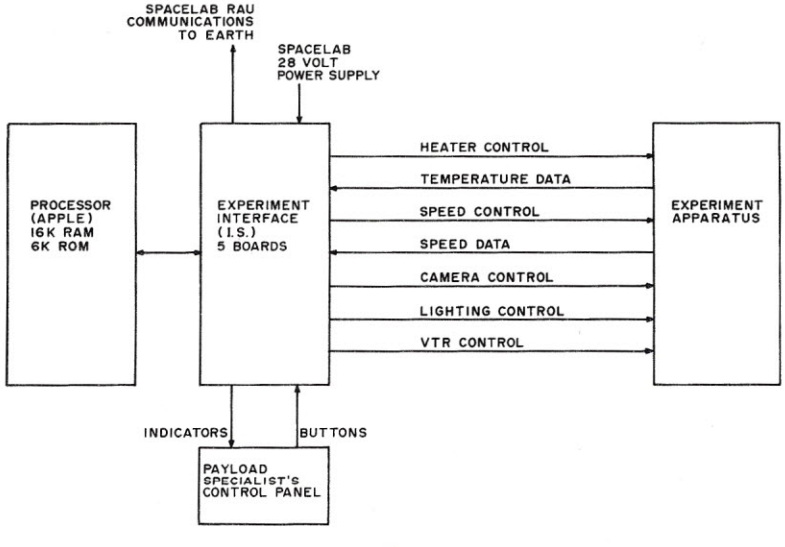


Fig. 1. Block diagram of the Space Shuttle experiment configuration developed by Interactive Structures.

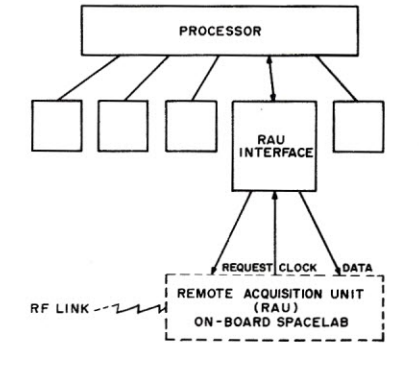


Fig. 4. Apple to Earth communications system.

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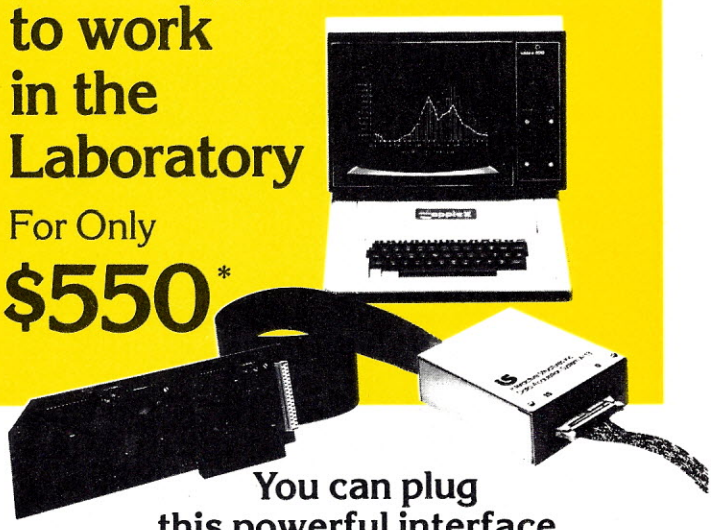
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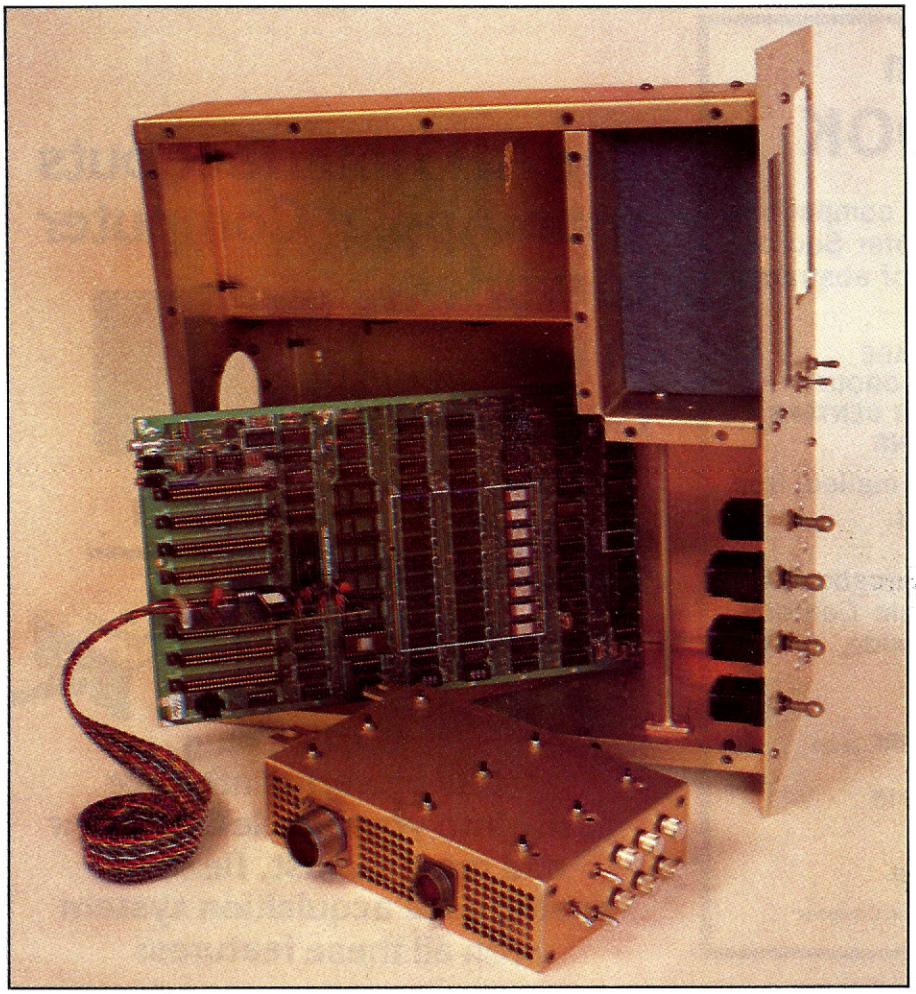
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Interactive Structures' DI09 bidirectional digital interface and AI02 analog input system used in Experiment 101.

and recorder) also use the most power, so a simple reserve battery system was not feasible.

The experiment therefore was designed with a special battery backup system which includes its own alarm clock (Fig. 5). This clock can power the entire experiment down for ten minutes, then power up and record video data, power down again, etc., with a resulting power savings of 10-to-1.

Packaging

Of course, the packaging of the system also needed some attention. The experiment is rack-mounted, so a metal enclosure was needed (Fig. 6). The vibration levels during lift-off and re-entry dictate that all connectors and plugs be held together firmly; all unnecessary connectors such as (you guessed it) IC sockets are a no-no. Also, in the absence of gravity, dirt, liquids and even metal particles may be found drifting through the air, so each and every exposed circuit element is coated with an insulating film. An entire custom-constructed Apple was created.

The project progressed, and it was time to test the Apple RAU interface. However, the RAU itself was still under construction in France, so an actual test was impossible. Interactive Structures pressed another Apple into service and outfitted it with an interface card which simulated all the timing and signal levels of the RAU. The RAU simulator (SRAU) would play the part of the shuttle's communications system and verify that Experiment 101 was transmitting information properly.

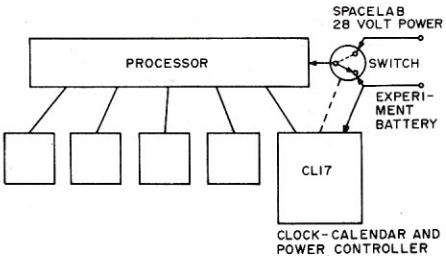


Fig. 5. Clock, power down and wake up system.

The payload specialists will play an important part in the experiment, since they are responsible for an extensive detailed script of all events during the seven-day mission. They will certainly be able to refer to the script as they use it, so memorization was not necessary. However, efficiency and accuracy were critical to the success of the mission. The project needed a training program so that realistic trial-runs could be made. Interactive Structures interfaced yet another Apple to a simulated front panel using DI09s, and developed software to conduct the trial-runs and watch for digressions from the script.

The experiment controller system underwent a series of functional tests (to verify that it managed the experiment properly) and environmental tests (to be sure it could withstand space flight conditions, mainly vibration and temperature extremes). Having passed all these tests, it now awaits a 1983 voyage. The combination of Interactive Structures interfaces and Apple microcomputers produced such a comprehensive instrumentation, testing and training capability at such a low cost that the same approach is now being considered for several new Spacelab experiments.

Conclusions

If we ignore the special preparations necessary for space flight, the experiment controller is not an unusual laboratory Apple installation. Interactive Structures interfaces are being used to make Apples into vibration monitors, chemical

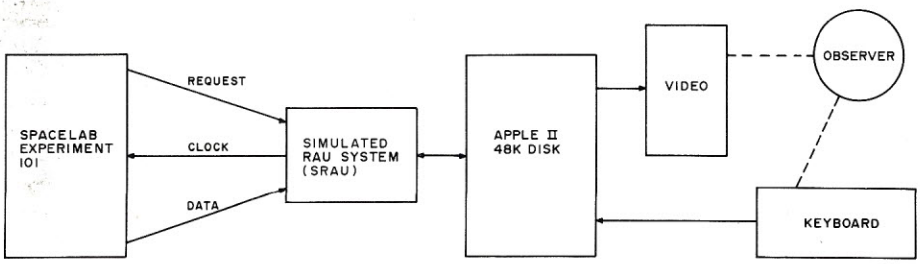


Fig. 6. RAU communications test system.

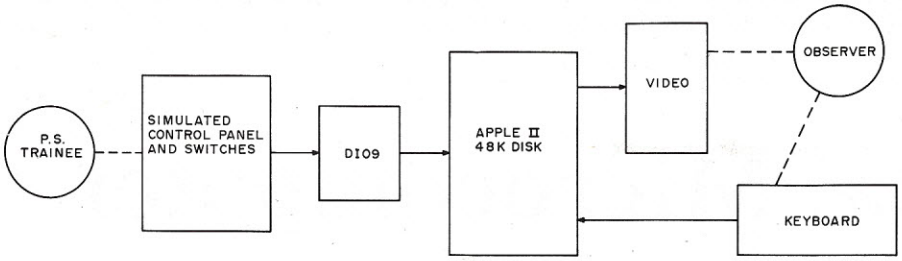


Fig. 7. Payload specialists' training system.

analyzers and temperature controllers, with new applications being added to the list daily.

The components are low in cost. They are modular so capabilities and expenditures expand only where needed.

For example, the AI13, a 16-channel, 12-bit analog data acquisition system which allows the software to independently select the input range for each reading, is now available from stock for $550. The DI09, used extensively in the experiment controller, provides 32 lines of digital I/O, plus eight other lines for handshaking, for $330. Apple Computer now offers an IEEE-488 interface card, and other companies are beginning to enter the Apple-based lab system market.

If the microprocessor was the first chapter in the story of the low-cost techniques which have been "spin-offs" from the space program, then laboratory and scientific capabilities for personal computers may be the second. Just as the microprocessor has brought the cost of computation out of the $10,000-and-above range, these interface modules allow all but the most unusual measurement or control applications for significantly less than $1000.■

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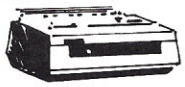
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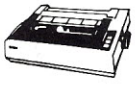
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How will micros be used in space? This author takes a look at the personal computer's role in man's greatest adventure.

The Final Microcomputer Frontier?

By John Edwards

I never knew what welding steel in space was like until I actually tried it. The man at the company's personnel office never promised it would be easy, but he also never said it would be as rough as it was. Imagine, if you can, welding in a zero-gravity situation—nothing to hold on to—every time you start up the lasertorch, it feels like some space bully is punching you in the chest. It was no picnic, let me tell you.

Another problem was the speed with which they had to recruit workers. That training class instructor went through the stuff so quickly, I barely had time to hear her, much less understand what she said. So what do I think of my personal computer? Well, let me tell you, my friend, if it wasn't for my little digital buddy telling me how and when to do what, me and my lasertorch would probably have been kicked into a permanent orbit around the earth by now.—Transcript report from a spacejourneyman, Prefab Welding Sector X1Z3, July 21, 2014.

Space-welding operations haven't started on a major scale yet, but microcomputers are already there—or just about. Scheduled to ride on an upcoming space shuttle mission is an 11-pound Apple II microcomputer. And, if predictions prove correct, this instrument should be only the first of an entire series of little computers winging their way to the stars.

At first, the idea of using micros in space may sound a trifle silly. After all, can't NASA afford something a bit more substantial? Have budget cuts gone so deep that the government has to buy ordinary personal computers for our astronauts to use? Well, it's a matter of perspective. What we consider ordinary computers just might be the proper tool for the job.

"Tool" is the key word. When our ancestors were first faced with clearing a continent, they, too, needed tools. For these hardy souls, picks, axes and hoes were necessities of life. Soon, space pioneers may come to look upon the personal computer as a vital instrument in *their* daily lives.

Why Microcomputers in Space?

Personal computers are ideally suited for space uses because of their small size and considerable computing power. While the micro being carried aboard upcoming space shuttle missions will only be used by astronauts and an elite group of scientists, it can be expected that as space travel becomes more commonplace, users of space micros will begin to more closely resemble their earth counterparts.

The micro's greatest promise in space exists in its unique ability to train people on a one-to-one basis. When more people begin migrating to orbiting work stations (perhaps by the beginning of the next century), education will become a formidable problem. For instance, how does one train construction workers, possessing experience only in terrestrial fields, to build structures in space? Considering the many specialized tasks that will have to be done, in-class instruction may prove to be expensive, save for the most general of topics.

By using personal computers, employees will be able to train in their own homes, at their own pace, perhaps reporting to a central school only for periodic check-ups and final examinations. Later on, since meeting space on orbiting stations will probably be at a premium, personal computers will allow workers to study new or updated material without returning to earth.

Personal Computer Helpers

Considering the phenomenal growth in microcomputer technology over the past few years, we can also expect that by the time space industrialization begins in earnest, micros will have far greater abilities. With continued advances in both hardware and software, future space micros will probably use highly developed voice synthesizers and speech recognition systems, allowing users with no computer background to verbally communicate with a micro as if it were a fellow human.

Use for such a computer would be as a "space helper." Since space work promises to be both intricate and hazardous, a computerized assistant could be a godsend. Imagine, for example, that while working on a deep space repair job, a normally routine procedure suddenly goes haywire. A quick consultation with your personal computer may be able to pinpoint the problem and explain exactly what went wrong.

One important hindrance while working in space is the fact that you can't easily refer to an instruction manual for guidance. By using a personal computer to feed a running commentary into your spacesuit communication system, complicated repairs and installations could be handled much more efficiently. A personal micro might even be able to spot an imminent mistake and give advance warning. Like they say, it's always nice to have a friend when visiting a strange place.

Micro Monitoring

So far, the microcomputer space

Address correspondence to John Edwards, 78-56 86th St., Glendale, NY 11385.

applications I've looked at border on the realm of science fiction. But there's one field where micros are not only expected to make a significant contribution, but are already doing so—the area of computer control. Much space work is made up of necessary, but repetitive, chores. These tasks include "housekeeping" (assessing and adjusting the environment of space workplaces) and the monitoring of scientific experiments. While housekeeping will be primarily the responsibility of larger computers, individual experiments will, in many cases, be supervised by micros.

Future microcomputer-controlled experiments, both in the Spacelab and future projects, should be limited only by man's imagination. Entire series of medical, resource exploration and manufacturing studies can be automatically monitored, leaving humans free to work on more important tasks. Clipboards needn't follow man into space.

Microcomputers as Space Design Aids

The microcomputer's versatility as a design tool for terrestrial engineers has long been recognized. In space, however, this feature takes on even added importance.

Colossal power-gathering satellites measuring hundreds of miles in diameter, space transportation systems, orbiting colonies—all must be designed and built with the help of computers. While large computers will do the lion's share of the central design work, it's hard to see how any space architectural engineer is going to be able to tackle his assignment without having his own computer close at hand. The sheer mathematics involved in designing such projects would, by itself, exhaust a platoon of scientists.

If mankind is indeed going to construct such mammoth projects, portable personal computers, and lots of them, must be at the fingertips of every man and woman involved.

Where Do We Go from Here?

This has only been a quick overview of the personal computer's potential in space. One thing is certain: there will be literally thousands of spaces uses for micros, just as there are thousands of earthbound uses. All that remains to be seen is exactly what shape these applications will take.■

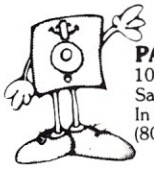
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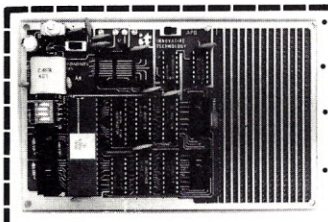
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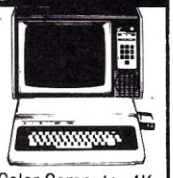
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Basic Random-File Record Keeping

By Murray L. Lesser

Several years ago, I began keeping a summary record of the sales taxes I paid, to check whether I was gaining or losing by using the IRS optional tables for the income tax deduction I was entitled to. I soon discovered I was paying much more than the tables would allow, so I now deduct the amount of general sales taxes my records will support. Since a file kept with a computer is not sufficient by itself to satisfy the IRS in case of audit, the only items I enter, using my Basic program SALESTAX, are those for which I have a cash receipt, cancelled check, charge-card tissue or other evidence. The file gives me the totals for filling out Form 1040, as well as an audit trail to the original paper.

Even if you don't need to keep a sales tax record, you may wish to modify SALESTAX for other record keeping purposes.

SALESTAX is a record-keeping program, not a file maintenance program. Once a record has been written to the file, there is no way of deleting it or modifying it without erasing the whole file and starting over.

Of course, no one could live with such a restriction unless the program gave the user plenty of chances for mind-changing, in case of input error. SALESTAX does. For example, it won't write to the file until you have had the opportunity to view the entire new record based on your input data, and have correctly answered the question, "Is this OK to file?"

SALESTAX keeps its file in Microsoft Disk Basic random mode. The primary advantage is security. You can modify sequential files with a text editor. You can't even read Microsoft Basic random files containing numerical data with an editor! You can't write another Basic program to read or modify a random record without having the file description from the original program.

Another advantage for record-keeping purposes is that you can tack a new record on to the end of the file without streaming the whole file through RAM.

Before I describe the program itself, and how to modify it to meet your needs, let us review the principles involved in using Microsoft disk Basic files.

Disk Basic Files

When you open any file, Basic sets up a disk I/O buffer in RAM to hole the *physical record* (usually one sector in length) to be written to (or read from) the diskette, along with a file control block (FCB) that tells the operating system where to find the file on the diskette and which physical record to deal with next. For sequential files, you establish whether you are planning to write or read by specifying that it is an "O" or an "I" file. The file number given in the OPEN statement is the identifier for the buffer and FCB; the name of the file is put into the FCB.

Writing to a sequential file is analogous to display or printer output. Basic inserts <CR> <LF> bytes to mark the end of each variable-length record. The variable-length fields in each record are in ASCII character form, separated by input-like delimiters. Reading from a sequential file is

Program listing. The Salestax program in Microsoft Basic-80.

```
00100  '              ***********************************
00110  '              ***   1982 SALES TAX RECORDS    ***
00120  '              ***********************************
00130  '
00140  '       Written by M. L. Lesser, August 24, 1981
00150  '       Based on subroutines in "1981 Tax Records" written 1/1/81
00160  '       Written in Microsoft BASIC-80, release 5.2
00170  '       Compiled with BASCOM 5.2, switch/Z
00180  '
00190  '       This program maintains a "random" file showing the sales tax
00200  '       paid during the year.  Each record shows the payments made
00210  '       during one period (usually one month).  The fields in the
00220  '       record carry the accumulated totals of the individual entries
00230  '       made in the following categories of payment type:
00240  '       Cash, Checks, American Express, MasterCard, and Other.
00250  '       The program adds two more fields: the total sales tax
00260  '       paid during that period, and the date the record was entered.
00270  '
00280  '       Reports may be displayed or printed, showing all records
00290  '       in the file and the accumulated total sales tax paid to date.
00300  '
00310  '       The program is written to be run on the A disk.  The file
```

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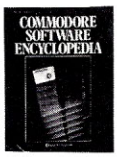


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```
00320   '       it maintains, SALESTAX.82, is on the B disk.  At the
00330   '       conclusion of a session with the program, a backup copy
00340   '       of SALESTAX.82 can be written to the A disk on demand.
00350   '
00500   '       Set up
00510   DEFDBL A                                        'Double-precision
00520   DEFINT I                                        'Integer variables
00530   DEFSTR D,P,R                                    'String variables
00540   DIM AMOUNT(40),PERCENT(40),TAX(40)              'Array variables
00550   '
00700   '       Only "FIELD" variables used in Microsoft's BASIC "Random"
00710   '       mode begin with the letter R.  In most cases, these have
00720   '       an obvious mnemonic connection with the corresponding
00730   '       program variables, where such exist.
00740   '
00750   '       Integer variables begin with the letter I.  Integer
00760   '       variables are used for flags and indices.  The other
00770   '       integer variables are IRECORD (the number of records in
00780   '       the file) and IPOST (the date the current record is
00790   '       being posted--in form <mmdd>).
00800   '
00810   '       AMOUNT is the only double-precision variable.  It is carried
00820   '       in this form to allow sales amounts of over $9,999.99 to
00830   '       be entered without loss of precision.  All TAX amounts,
00840   '       including the totals year-to-date, are precise only when
00850   '       the value is less than $10,000.
00860   '
00870   '       The array variables are used for storing the raw input
00880   '       prior to verification.  After the 40th entry, the
00890   '       program will jump to the next payment category with no
00900   '       verification.
00910   '
01000   '       Main Program
01010   GOSUB 10000                                     'Clear screen
01020   PRINT: PRINT
01030   INPUT "Enter today's date (MMDD):  ", IPOST
01040   GOSUB 2000                                      'Open Sales Tax File
01100   '       Function choice:
01110   PRINT: PRINT
01120   PRINT "Functions available for Sales Tax File:"
01130   PRINT
01140   PRINT , "0", "QUIT"
01150   PRINT , "1", "Display File"
01160   PRINT , "2", "Data Entry; Post New Record"
01170   PRINT , "3", "List File"
01180   PRINT: PRINT
01190   PRINT "Which Function?"
01200   LET IFUNC = VAL(INPUT$(1))
01210   IF IFUNC = 0 THEN GOTO 61000                    'Make backup and end
01220   IF IFUNC = 2 THEN GOSUB 3000                    'Enter Sales Tax Record
01230   IF IFUNC = 3 THEN LET ILIST = -1 ELSE LET ILIST = 0
01240   IF IFUNC = 1 OR IFUNC = 3 THEN GOSUB 4000       'Display/List File
01250   '       Go around again
01260   GOSUB 10000                                     'Clear screen
01270   GOTO 1100                                       'Function choice
01280   '
02000   '       Subroutine: Open Sales Tax File
02010   OPEN "R", #1, "B:SALESTAX.82", 32               '32-byte records
02020   FIELD #1, 2 AS RECORD, 4 AS RTAX, 26 AS RDUMMY  'Leader record
02030   FIELD #1, 2 AS RPOST, 6 AS RPERIOD, 4 AS RCASH, 4 AS RCHECK,
            4 AS RAMEX, 4 AS RMSCD, 4 AS ROTHER, 4 AS RTOTAL
02040   IF LOF(1) = 0 THEN GOSUB 11000                  'Initialize file
02050   RETURN
02060   '
03000   '       Function routine: Post new sales tax record
03010   GOSUB 10000                                     'Clear screen
03020   PRINT: PRINT "Entering New Sales Tax Record:": PRINT
03030   GOSUB 12000                                     'Get leader data
03040   '       Start new record
03050   LINE INPUT "Enter Tax Period (6 characters or less):  "; PERIOD
03060   LSET RPERIOD = PERIOD
03070   LSET RPOST = MKI$(IPOST)
03080   '       Enter data
03090   LET DUMMY = "CASH RECEIPTS"
03100   GOSUB 20000                                     'Data entry
03110   LSET RCASH = MKS$(TOTAL)                        'Post cash entry
03120   LET DUMMY = "CHECKS WRITTEN"
03130   GOSUB 20000                                     'Data entry
03140   LSET RCHECK = MKS$(TOTAL)                       'Post checks entry
03150   LET DUMMY = "AMEX TICKETS PAID"
03160   GOSUB 20000                                     'Data entry
03170   LSET RAMEX = MKS$(TOTAL)                        'Post AMEX entry
03180   LET DUMMY = "MASTERCARD TICKETS PAID"
03190   GOSUB 20000                                     'Data entry
03200   LSET RMSCD = MKS$(TOTAL)                        'Post MasterCard entry
03210   LET DUMMY = "OTHER SALES TAX PAID"
03220   GOSUB 20000                                     'Data entry
03230   LSET ROTHER = MKS$(TOTAL)                       'Post "others" entry
```

More

analogous to keyboard input.

When you open an "O" file, an existing file of that name on that drive will be erased and you will start a new file. Thus, you cannot read from and write to the same sequential file at the same time, so you can't update in place.

Unlike a sequential file, a random file is made up of records of fixed length. You establish the length when you open an "R" file. (For example, the records kept in SALESTAX are all 32 bytes long; see line 2010 in the listing.) You can read or write any individual record in a random file, so you can update in place.

You get random records to read them, and put records to write them. Of course, you have to specify both the filenumber and the record number in GET or PUT statements.

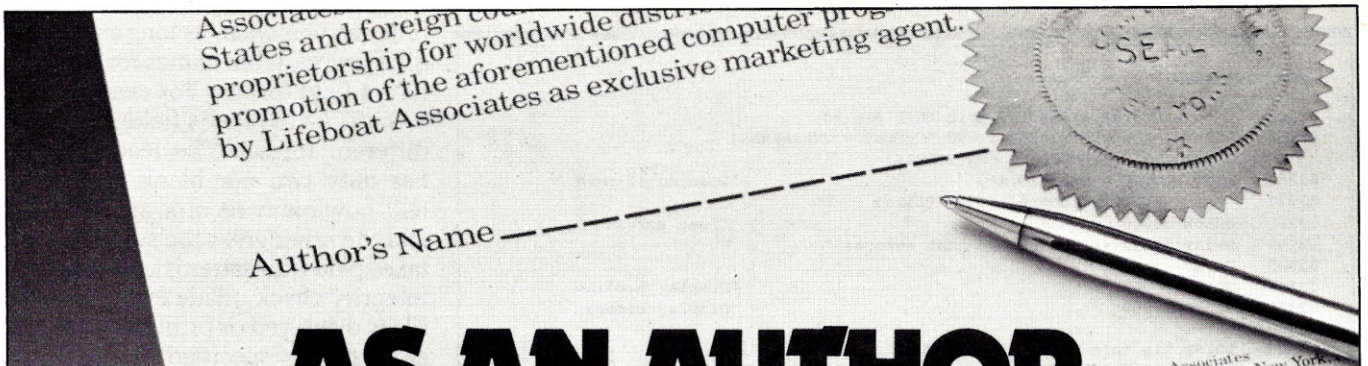
When you open an "R" file, a record-length field buffer is also set up. When you get a record, Basic determines which one or more physical records contain that *logical record*. The operating system is called to find and read the physical records into the disk I/O buffer. The logical record is assembled in the field buffer. When you put a record, the physical records that contain the old logical record are brought into the disk I/O buffer before the replacement is made. If the entire logical record is in disk I/O buffer at the time of a GET or PUT, it is not necessary to make the disk access.

Whether or not a logical record spans more than one physical record depends on their relative lengths. If the logical record length is a divisor of the physical record length, the logical record will always be contained within a single physical record. This will minimize disk traffic and increase performance slightly. I usually specify my random records to contain 32 or 64 bytes.

A random file, as recorded on a diskette, does not have any record or field separators in it. Before you can make use of a random record in a program, you must specify each field by an "n AS fieldname" segment in a field statement. The n is the length of the field, in bytes; the fieldname must be defined as a string variable not used for any other purpose.

The FIELD statement lists all of the fields in the record, in order and separated by commas. The fields can be of differing lengths, but the sum of the lengths of the fields cannot exceed the record length.

You can field a single file as many



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```
03240   '       Total sales tax paid this period
03250   LET TOTAL = CVS(RCASH) + CVS(RCHECK) + CVS(RAMEX)
                + CVS(RMSCD) + CVS(ROTHER)
03260   LSET RTOTAL = MKS$(TOTAL)                       'Post total paid
03270   '       Verify record before filing
03280   GOSUB 10000                                     'Clear screen
03290   PRINT "This is the record just entered:"
03300   PRINT
03310   GOSUB 30000                                     'Display heading
03320   GOSUB 31000                                     'Display record
03330   PRINT
03340   PRINT "Is this OK to file (Y/N)?"
03350   LET PASS = INPUT$(1)
03360   IF PASS <> "Y" AND PASS <> "y" THEN RETURN      'Verification failed
03400   '       Store Sales Tax Record
03410   LET TAX(0) = TAX(0) + TOTAL
03420   LET IRECORD = IRECORD + 1
03430   PUT #1, IRECORD
03500   '       Update leader record
03510   GET #1, 1
03520   LSET RECORD = MKI$(IRECORD)
03530   LSET RTAX = MKS$(TAX(0))
03540   PUT #1, 1
03550   RETURN
03560   '
04000   '       Function routine:  Display/List File
04010   GOSUB 10000                                     'Clear screen
04020   GOSUB 12000                                     'Get leader data
04030   IF ILIST THEN PRINT "Listing Sales Tax File"
04040   IF ILIST THEN GOSUB 32000 ELSE GOSUB 30000      'Show Heading
04050   LET TOTAL = 0
04060   FOR I = 2 TO IRECORD
04070           GET #1, I
04080           LET TOTAL = TOTAL + CVS(RTOTAL)
04090           IF ILIST THEN GOSUB 33000
                        ELSE GOSUB 31000                'Show record
04100   NEXT I
04110   IF INT(100*TOTAL+0.5) <> INT(100*TAX(0)+0.5)
                THEN GOTO 60000                         'File error
04120   IF ILIST THEN GOSUB 34000                       'LPrint Sales Tax Total
04130   IF ILIST THEN RETURN
04140   PRINT
04150   PRINT "Total sales tax paid is:  ";
04160   PRINT USING "$$###.##"; TAX(0)
04170   PRINT
04180   PRINT "---Press any key to Continue---"
04190   WHILE INKEY$ = ""                               'If no input pending
04200   WEND                                            '   keep on looping
04210   RETURN
04220   '
10000   '       Subroutine:  Clear and home display
10010   '        Note:  This subroutine is for a P-E 550 display terminal.
10020   '               Rewrite to suit user environment.
10030   PRINT CHR$(27) "K" STRING$(20,0)
10040   RETURN
10050   '
11000   '       Subroutine: Initialize file on first use
11010   LSET RECORD = MKI$(1)                           'Make leader record
11020   LSET RTAX = MKS$(0)                             'Zero accumulated tax
11030   LSET RDUMMY = " "                               'Fill with blanks
11040   PUT #1, 1
11050   RETURN
11060   '
12000   '       Subroutine:  Get leader data
12010   GET #1, 1                                       'Read leader record
12020   LET TAX(0) = CVS(RTAX)                          'Accumulated tax
12030   LET IRECORD = CVI(RECORD)                       'Last record posted
12040   RETURN
12050   '
20000   '       Subroutine: Data Entry for Payment Category
20010   GOSUB 10000                                     'Clear Screen
20020   PRINT "Enter Data from " DUMMY " for " PERIOD
20030   PRINT , "If amount entered is total paid, enter tax rate as percentage"
20035   PRINT , "If amount entered is actual tax, enter tax rate as 'A'"
20040   PRINT , "To quit entering data into this field, enter amount as '0';"
20050   PRINT , "   for input verification, enter rate as 'V', else '0'."
20060   PRINT
20070   '       Input Data
20080   LET I = 0: AMOUNT(0) = 1: IVERIFY = 1: TOTAL = 0
20090   '       Enter Item
20100   WHILE AMOUNT(I) <> 0 AND I < 40 AND IVERIFY <> 0
20110           LET I = I + 1
20120           INPUT "Amount, Rate "; AMOUNT(I), PERCENT(I)
20130           IF PERCENT(I) = "V" OR PERCENT(I) = "v"
                        THEN GOSUB 21000                'Verify input
20140           IF PERCENT(I) = "A" OR PERCENT(I) = "a" THEN
                   TAX(I) = AMOUNT(I)  ELSE
                   TAX(I) = (VAL(PERCENT(I))*AMOUNT(I))/(100+VAL(PERCENT(I)))
```

More

times as you wish, as long as you use different variable names for each different field format. For example, the SALESTAX.82 file is fielded in three different formats.The leader record has only two non-blank fields: one tells how many records are in the file and the other gives the sum of all the taxes paid (this latter is used for a file integrity check, made every time the file is displayed or printed). The leader format is specified in line 2020. The second field format is for the tax-records themselves, in line 2030. Finally, there is a full-record field, used for all the records in the file when making a backup (line 61050).

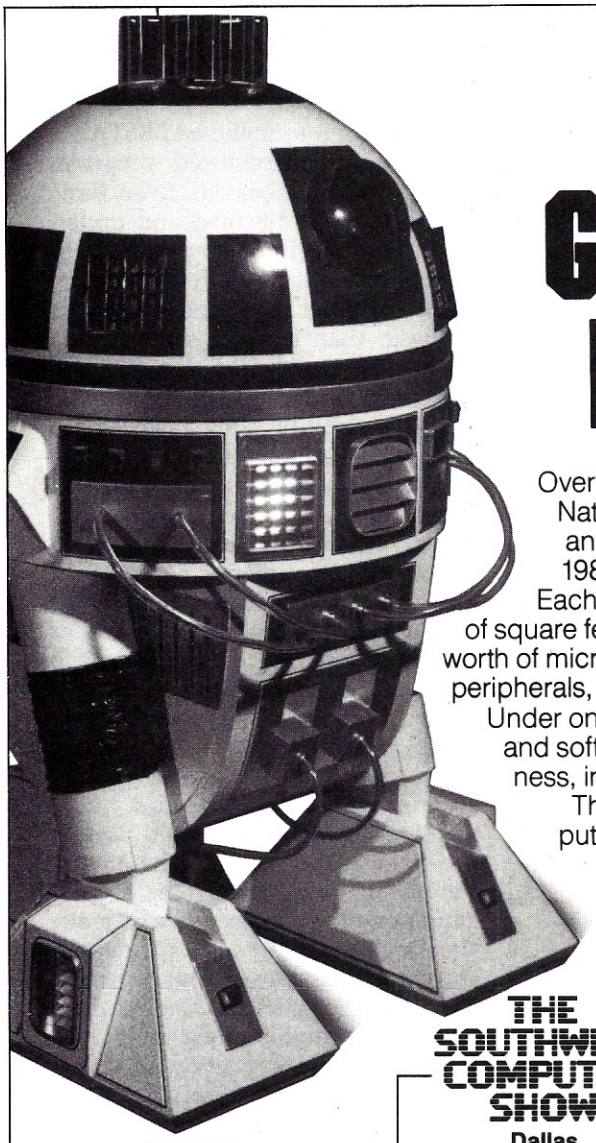
You load data into the FIELD buffer by using the LSET and RSET commands, before filing the record with a PUT statement. The two field-load commands put a string into the field. LSET (RSET) left (right) justifies the string into the field. If the string is too long to fit in the field, it is right (left) truncated. If it is too short, the rest of the field is padded with ASCII blanks. An example of the use of LSET with a string variable is given in line 3060.

Only strings can be used in an LSET or RSET statement. So how can you put a numeric variable into a random record? This is where Microsoft is very clever. Its Basic can treat the data bytes of numeric variables as pseudo-strings, made up of a sequence of bits rather than of ASCII characters.

The function MKI$( ) makes an integer into a two-byte pseudo-string for loading into the FIELD buffer. Similarly, MKS$( ) and MKD$( ) will make four-byte and eight-byte "strings" out of single- and double-precision floating numbers, respectively. Just remember that MKx$ makes a pseudo-string ($) out of a numeric variable of type x. You will find statements using LSET with MKI$ and MKS$ in the subroutine starting on line 3000.

After you get a record, you tell Basic that these pseudo-strings are really numeric variables by using the corresponding convert functions—CVI( ), CVS( ) and CVD( ). The subroutines starting on line 3000 and on line 31000 have statements using the CVx functions in differing ways.

You have to close any file that has been written to. When you close a file, you are telling Basic to write any unfiled data in the disk I/O buffer to the diskette and update the diskette directory with the information



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Listing continued.

```
20150           LET TOTAL = TOTAL + .01 * (INT(100 * TAX(I) + 0.5))
20160   WEND
20170   IF IVERIFY = 0 THEN GOTO 20000                  'Error, Reenter data
20180   RETURN
20190   '
21000   '       Subroutine: Verify Input Data
21010   GOSUB 10000                                     'Clear Screen
21020   PRINT "The following were entered for " DUMMY " for " PERIOD
21030   PRINT
21040   PRINT "  Amount", "Tax Rate", "   Tax": PRINT
21050   FOR IX = 1 TO I - 1
21060           PRINT USING "$$####.##      "; AMOUNT(IX);
21070           IF (PERCENT(IX) = "A") OR (PERCENT(IX) = "a")
                        THEN PRINT "    " PERCENT(IX),: GOTO 21100
21080           PRINT USING "###.##"; VAL(PERCENT(IX));
21090           PRINT "% ",
21100           PRINT USING "$$###.##"; TAX(IX)
21110   NEXT IX
21120   PRINT
21130   PRINT "Total sales tax from " DUMMY " is ";
21140   PRINT USING "$$###.##"; TOTAL
21150   PRINT
21160   PRINT "Is this OK (Y/N)?"
21170   LET PASS = INPUT$(1)
21180   IF (PASS = "Y") OR (PASS = "y") THEN IVERIFY = 1 ELSE IVERIFY = 0
21190   RETURN
21200   '
30000   '       Subroutine: Display Sales Tax Heading
30010   PRINT
30020   PRINT "PERIOD   " "   CASH   " "  CHECKS  " "   AMEX   "
              "  MSTRCD  " "  OTHER  " "   TOTAL   " "  POSTED"
30030   PRINT
30040   RETURN
30050   '
31000   '       Subroutine: Display Sales Tax Record
31010   PRINT RPERIOD "   ";
31020   PRINT USING "$$###.##  "; CVS(RCASH); CVS(RCHECK);
              CVS(RAMEX); CVS(RMSCD); CVS(ROTHER); CVS(RTOTAL);
31030   PRINT USING "   ####"; CVI(RPOST)
31040   RETURN
31050   '
32000   '       Subroutine: LPrint Sales Tax Heading
32010   LPRINT TAB(10) "SALES TAX FILE"                 'Left margin at 10
32020   LPRINT
32030   LPRINT TAB(10) "PERIOD   " "   CASH   " "  CHECKS  " "   AMEX   "
              "  MSTRCD  " "  OTHER  " "   TOTAL   " "  POSTED"
32040   LPRINT
32050   RETURN
32060   '
33000   '       Subroutine: LPrint Sales Tax Record
33010   LPRINT TAB(10) RPERIOD "   ";
33020   LPRINT USING "$$###.##  "; CVS(RCASH); CVS(RCHECK); CVS(RAMEX);
              CVS(RMSCD); CVS(ROTHER); CVS(RTOTAL);
33030   LPRINT USING "   ####"; CVI(RPOST)
33040   RETURN
33050   '
34000   '       Subroutine: LPrint Sales Tax Total
34010   LPRINT: LPRINT
34020   LPRINT TAB(10) "Total sales tax paid is: ";
34030   LPRINT USING "$$###.##"; TAX(0)
34040   RETURN
34050   '
60000   '       File error routine: Totals don't match to penny
60010   PRINT "FILE DOES NOT BALANCE"
60020   PRINT "ABORTING PROGRAM"
60030   PRINT "USE BACKUP FILE AND UPDATE"
60040   GOTO 62000                                      'Close file and END
60050   '
61000   '       Function routine:  Quit, make back-up file
61010   GOSUB 10000                                     'Clear Screen
61020   PRINT "Do you want a backup file (Y/N)? "
61030   LET PASS = INPUT$(1)
61040   IF PASS <> "Y" AND PASS <> "y"
                THEN GOTO 62000                         'Close files and End
61050   FIELD #1, 32 AS RFILE
61060   OPEN "R", #2, "A:BACKUP.TAX", 32
61070   FIELD #2, 32 AS RBACKUP
61080   GET #1,1
61090   LET IRECORD = CVI(RECORD)
61100   FOR I = 1 TO IRECORD
61110           GET #1, I
61120           LSET RBACKUP = RFILE
61130           PUT #2, I
61140   NEXT I
62000   '       Close files and End
62010   CLOSE
62020   END
62030   '
```

contained in the FCB. If your CLOSE statement does not specify a particular filenumber, all open files are closed.

I have tried to make SALESTAX a readable, well-structured program, for ease of maintenance. Even Basic programs must be read and understood (and modified) by humans as well as by machines. It is easier to write readable structured programs in Basic than it is in some of the languages specifically designed for structured programming; Basic has some readability advantages. With Basic, you can put the main routine and the subroutines in any order you wish—for the reader's convenience rather than for the language-inventor's convenience. And, since all GOTO or GOSUB calls require a target statement number, the reader always knows where on the listing to look for the routine being called. Of course, you don't *have* to write structured programs if you are using Basic, which may be what bothers some of the language's critics.

If your dialect of Microsoft Basic is the same as mine, the comments in the listing—along with the figures simulating the display—should make the program almost self-explanatory. However, I have used some operator convenience constructs that may not be familiar to you, along with some little-used Basic functions, so an explanation of what it going on, and how to change things if you want or need to, might be useful.

Some Details

As with many file maintenance programs, SALESTAX is menu driven. A simulation of the screen showing the initial menu presentation after entry of the posting date is given in Fig. 1. However, unlike many menu-driven programs, SALESTAX uses single-key entry whenever feasible. You do not hit the return key for any purpose except to enter actual data. Thus, if you press the 1 key in response to the "Which Function" question, SALESTAX will display the file immediately, as shown in Fig. 2.

If you're so fond of hitting return that you can't break the habit, or if your version of Basic doesn't have the INPUT$( ) function, you can replace line 1190 with:

```
INPUT "Which Function"; IFUNC
```

and delete line 1200. Make a similar substitution for the PASS string vari-

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able used in answering the yes/no questions in the verification subroutines (lines 3340–3350, 21160–21170 and 61020–61030).

When you are actually entering data for a payment category, the screen will look like Fig. 3. Note the various modes of entering data, depending on whether your document shows the actual tax paid or merely the total amount of the transaction and the percentage tax rate. If you think you have made a mistake, or merely want to verify the input before going on to the next category, enter a V for the rate. What you get back is shown in Fig. 4, for the same input data. Any answer to the question other than Y or y will send you back to the beginning of entering data for that payment category.

The leader record must exist before any entries can be made to the file. In my version, I use the initialization subroutine starting on line 11000 only once—the first time I run the program each year. The program knows it is the first time because the length of file, given by the LOF function at line 2040, will be zero.

However, whether Basic-80 has the LOF function depends on the operating system it is running under. If you don't have LOF, you should write a stand-alone program to initialize the file. This little program would consist of lines 2010–2020, lines 11010–11040 and lines 62010–62020. If you use stand-alone initialization, you should delete line 2040 and lines 11000–11060 from SALESTAX.

I don't like to enter data at the bottom of the screen cluttered up with other details not germane to the immediate task at hand. So every entry operation starts at the top of a clean screen. This leads to lots of Clear Screen commands and my Basic

```
Enter today's date (MMDD): 831
Functions available for Sales Tax File:
    0    QUIT
    1    Display File
    2    Data Entry; Post New Record
    3    List File
Which Function?
```

Fig. 1. Initial menu display.

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---Press any key to Continue---

Fig. 2. Console display of sample file.

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doesn't have one. I have put the somewhat laborious PRINT equivalent for my terminal in the subroutine starting on line 10000. If you have a Clear Screen command available, substitute it for each of the eight statements, GOSUB 10000 and delete the subroutine.

An important part of the data-input subroutine, starting on line 20000, is a WHILE. . . WEND loop. (WEND means while loop ends.) If your dialect of Basic doesn't have this function, you can do the same thing by substituting an inverted IF. . . GOTO for the WHILE and a GOTO for the WEND. For example, replace line 20100 with:

IF AMOUNT(I) = 0 OR I = 40 OR IVERIFY = 0 THEN GOTO 20170 and replace line 20160 with GOTO 20100.

If your version of Basic doesn't meet all the ANSI standards, you may have to change the Display/List subroutine starting in line 4000. Standard Basic tests the index in FOR . . . TO loops at the FOR. . . TO statement. Thus, if the index is greater than the loop ending value on the initial pass, the loop will be skipped. Many older versions of Basic perpetuate John Backus' mistake (made in the original Fortran, first released in 1957), and test at the NEXT. With the Fortran approach, the program will always take the loop at least once. This can lead to catastrophe if you should ask SALESTAX to display or list the file before there have been any entries. The fix is to insert line 4055:

IF IRECORD = 1 THEN GOTO 4110

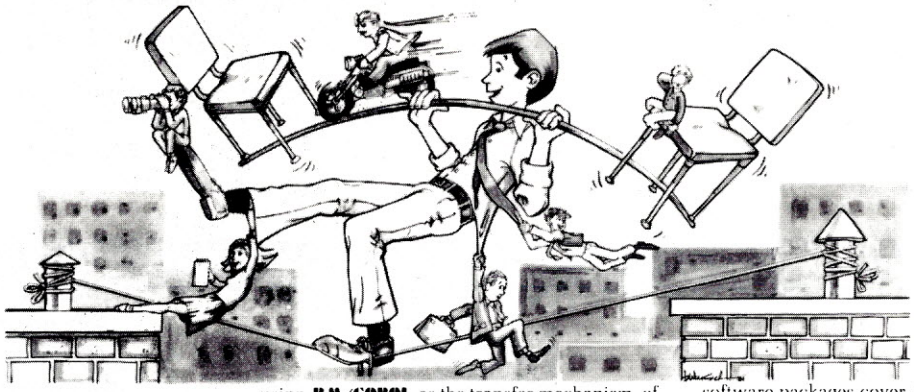
If you have a nonstandard Basic that starts numbering arrays from (1), instead of from (0), you will have to make a more extensive change. All appearances of TAX(0) (lines 3410, 3530, 4110, 4160, 12020 and 34030) will have to be changed to TAX(1). Change AMOUNT(0) in line 20080 to

```
Enter Data from CHECKS WRITTEN for AUG 82
     If amount entered is total paid, enter tax rate as percentage
     If amount entered is actual tax, enter tax rate as 'A'
     To quit entering data into this field, enter amount as '0';
          for input verification, enter rate as 'V', else '0'.

Amount, Rate ? .16,A
Amount, Rate ? 17.75,5
Amount, Rate ? 1.75,a
Amount, Rate ? 64.83,5
Amount, Rate ? 23.46,5
Amount, Rate ? 49.39,5
Amount, Rate ? 26.26,1
Amount, Rate ? 13.69,5
Amount, Rate ? 19.96,5
Amount, Rate ? 19.96,5
Amount, Rate ? .8,a
Amount, Rate ? 0,v
```

Fig. 3. Entering data.

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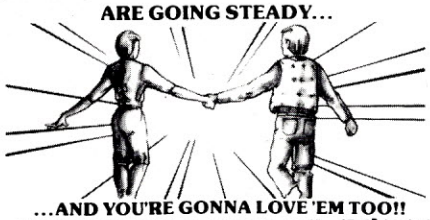
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AMOUNT(1). Then, change line 21050 to read:

```
FOR IX = 2 TO I-1
```

There are several changes you should make to personalize SALESTAX to fit your own situation. The display layout (Fig. 2) is set up for 80 columns, the printed output (not shown) for 100. If your system differs, you must change the subroutines in lines 30000–34050. You may wish to change the field headings to suit your own requirements. These, and the associated variable names, appear in the subroutines starting in lines 2000 and 3000, as well as in the detail display/print subroutines in the 30000 series. If you delete or add fields, you will have to change the record length to suit. Besides making changes in the subroutines mentioned above, you will have to modify the backup file specifications in lines 61050–61070.

Unlike those of us who use compilers, many users of interpretive Basics have learned a number of bad habits (which lead to unreadable, nonmaintainable programs) in an attempt to save memory space and running time. The most common bad habit is to eliminate all the remarks. If you are using an interpreter, I suggest you delete only the introductory remarks prior to line 1000 and insert a few new ones to remind you where to find the original documentation (this issue of *Microcomputing*) in case of later difficulty. You will save a little over 2K of memory space and the negligible associated running time.

If you insist, you can also remove most of the remaining remarks. However, I recommend strongly that you leave the line-end remarks telling where the GOTO or GOSUB is going (if your version of Basic allows them) and at least an abbreviated version of the subroutine entry-line remarks. These will more than pay for themselves if you modify the program extensively and later have to trace your path to find an elusive bug.

You can shorten the variable names down to two characters each, if you wish to go further along the route toward unreadability (or are forced to because of the limitations of the Basic dialect you are using). In most cases, you can use the first two letters of the names I have used. However, following this rule blindly will lead to a few duplications and some contractions to reserved words, so take care.

The ultimate interpreter-user's abomination—which produces completely unreadable programs—is leaving out the spaces between variable names and reserved words. Programmers who commit this crime should be forced to spend six months on bread and water, trying to make sense out of a complicated program written by an idiot.

I hope using SALESTAX saves you a lot of money next April. But even if it doesn't, perhaps you have learned something about using Basic random files, as well as how to build in some user convenience aids, for the next time you design a record keeping or file maintenance program.■

The following were entered for CHECKS WRITTEN for AUG 82

Amount	Tax Rate	Tax
$0.16	A	$0.16
$17.75	5.00%	$0.85
$1.75	a	$1.75
$64.83	5.00%	$3.09
$23.46	5.00%	$1.12
$49.39	5.00%	$2.35
$26.26	1.00%	$0.26
$13.69	5.00%	$.065
$19.96	5.00%	$0.95
$0.80	a	$0.80

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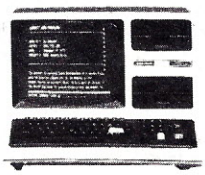
Is this OK (Y/N)?

Fig. 4. Verifying input data.

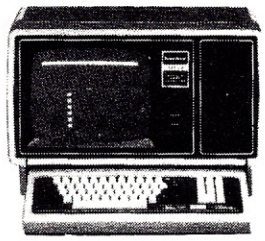
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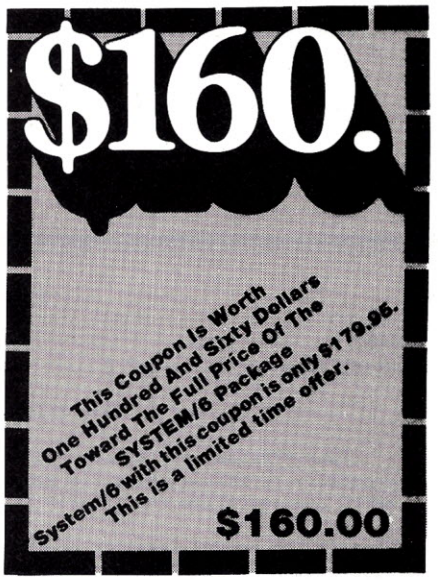
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The next time you have to use the magic PIA chip, let your micro figure out the configuration process.

PIA Initialization

By Gene Embry

Sample run.

```
RUN
Which port for output  ? 3

                        PIA Initialization

    This program will assist you to determine the code
necessary to initialize a PIA device.  We assume that the
SWTPC configuration for the PIA is used.

What is the memory location of CRA   ? 8001
Will Side A of the PIA be used  ? Y

         CLR       $8001  Clear out control register

Will all lines of side A  be inputs ? N
Will all lines of side A  be outputs ? Y

         LDA A     #%1111-1111    All lines are outputs


         STA A     $8001-1

Will you use CA 1 as input interrupt  ? N
Will CA 2 be used as an input  ? N
Will CA2 be used an an output  ? N

         LDA A     #%0000-0100    Note configuration
         STA A     $8001

Do you want to configure Side B of the PIA  ? Y

         CLR       $8001+2  Clear out control register

Will all lines of side B be inputs ? N
Will all lines of side B be outputs ? N
Specify i/o configuration of the data line #1  (I=input O=output)  ? I
Specify i/o configuration of the data line #2  (I=input O=output)  ? I
Specify i/o configuration of the data line #3  (I=input O=output)  ? I
Specify i/o configuration of the data line #4  (I=input O=output)  ? I
Specify i/o configuration of the data line #5  (I=input O=output)  ? O
Specify i/o configuration of the data line #6  (I=input O=output)  ? O
Specify i/o configuration of the data line #7  (I=input O=output)  ? O
Specify i/o configuration of the data line #8  (I=input O=output)  ? O

         LDA A     #%1111-0000     0=input  1 = output
         STA A     $8001+1

Will you use CB1 as input interrupt  ? Y

There are 4 options to choose from.
Remember: CB1 is input only.

1. Interrupt on a high-to-low transition- IRQ is diabled.
2. Same as 1 but IRQ goes low causing IRQ interrupt to cpu.
3. Interrupt on a low-to-high transition - IRQ is disabled.
4. Same as 3 except IRQ goes low causing IRQ interrupt to cpu.
```

More

The peripheral interface adapter (PIA) is a magical device. Manufactured by Motorola as the Model 6820 and by several other companies, the PIA interfaces parallel information from the computer to the outside world or vice versa. It not only will function as an interface to parallel devices but can be forced to operate as a serial device under software control, such as with Motorola's MIKBUG monitor.

It has one other feature that has yet to be covered in the literature. The configuration process tends to drive novice programmers crazy.

This Basic program eliminates the need to think when initializing the PIA.

The PIA occupies four read/write memory locations on your computer. If you're using the SS-50 bus for your computer, the order of the six PIA registers will probably be as follows:

The first address is assigned to side A for the peripheral register and the data direction register. The second address is assigned to control register of side A. The third and fourth addresses are the same, except side B is involved.

The program asks a series of long questions (see Sample run). Only three operand codes are used during the process: CLR, LDA A and STA A. The corresponding 6800 machine code is $7F, $86 and $B7. Not only may you configure sides A and B as inputs or outputs but you may configure the individual lines as either inputs or outputs. Finally, if you are planning to use the control lines, you can do so.■

Address correspondence to Gene Embry, Route 1, Box 151-H, Morrisville, NC 27560.

Sample run continued.

```
Make selection  ? 2
Will CB2 be used as an input  ? N
Will CB2 be used an an output  ? Y
Configuring CB2 as an output.
Note that CRB5 is high.

1. Goes low on positive transition of E after a WRITE to DRB.
   Goes high when CB1 is set!
2. Goes low as above. Goes high on positive edge of E during a deselect.
3. Goes low when CRB-3 goes low as a result of a Write to CRB.
   Goes high when a WRITE to CRB sets CRB-3 high.
4. Stays high as long as CRB3 is high. Cleared when WRITE to CRB.
   Goes high when CRB-3 is set high as a result of WRITE to CRB.

Make selection  ? 3

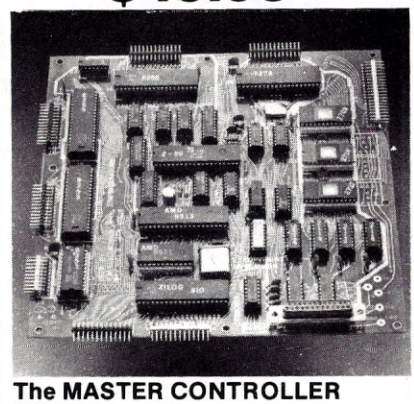
        LDA A     #%0011-0101   Note configuration
        STA A     $8001+2
```

Program listing. 6800 Basic PIA initialization program.

```
0001 : PIASET.UP
0002 :
0003 : Gene Embry
0004 : 9/28/80
0005 :
0006 : Ref. Lance A. Leventhal, 6800 Assembly Language Programming
0007 : :    Osborne & Associates, chapter 11
0008 :
0020 GOSUB 9800::To initialize the program variables
0099 :
0100 : Main Section
0101 :
0110 HOME
0112 PRINT TAB(W-LEN(T$)/2);T$
0114 PRINT
0116 PRINT TAB(5);"This program will assist you to determine the code"
0118 PRINT "necessary to initialize a PIA device.  We assume that the"
0120 PRINT "SWTPC configuration for the PIA is used.":PRINT
0122 INPUT "What is the memory location of CRA  ",A$
0130 INPUT "Will Side A of the PIA be used ",Q$
0132 IF Q$ = "n" THEN Q$ = "N"
0134 IF Q$ = "N" THEN 200
0150 LET P$ = A$
0152 LET P$ ="$" + P$+"  Clear out control register"
0154 LET C$ = "CLR ":GOSUB 8000::Print a line of code
0156 LET S$ = "A ":IF F1 <> 0 THEN S$ = "B"
0160 GOSUB 1000::Determine how the Side will be used.
0162 LET C$ = "LDA A":GOSUB 8000::Print a line
0166 LET O$ = "-1":IF F1 <> 0 THEN O$ = "+1"
0168 LET C$="STA A":P$="$"+A$+ O$:GOSUB 8000
0170 GOSUB 2000::Configure CA1 (CB1)
0180 GOSUB 3000::Configure CA2 (CB2)
0182 LET P$ = "#%"+LEFT$(P$,4)+"-"+RIGHT$(P$,4)+"   Note configuration"
0184 LET C$ = "LDA A":GOSUB 8000
0186 LET O$ = "":IF F1 <> 0 THEN O$="+2"
0188 LET C$ = "STA A":P$="$"+A$ + O$:GOSUB 8000
0190 IF F1 <> 0 THEN 900::Done
0199 :
0200 : Check for Side B configuration
0201 :
0210 IF F1 = 0 GOSUB 9700:: Might want to configure Side B
0220 IF F1 = 2 THEN 900::Side B will not be used
0230 LET P$ = A$ + "+2"
0240 GOTO 152:: Configure Side B
0299 :
0900 : Finished
0901 :
0970 PRINT
0980 PRINT "Bye!"
0990 END
0999 :
1000 : Selecting of Input & Output lines
1001 :
1010 LET P$=""
1020 PRINT "Will all lines of side ";S$;" be inputs";:INPUT Q$
1022 IF Q$="y" THEN Q$="Y"
1024 IF Q$="Y" THEN P$="#%0000-0000      All lines are inputs":GOTO 1090
1030 PRINT "Will all lines of side ";S$;" be outputs";:INPUT Q$
1032 IF Q$="y" THEN Q$="Y"
1034 IF Q$="Y" THEN P$ = "#%1111-1111    All lines are outputs":GOTO 1090
1040 FOR X=1 TO 8          ::   Get the data line bit structure
1046 PRINT "Specify i/o configuration of the data line #";X;
1048 INPUT " (I=input O=output) ",Q$
1050 IF Q$ <> "I" IF Q$ <> "O" THEN PRINT CHR$(7):PRINT "Reenter":GOTO 1046
1052 IF Q$="I" THEN Q$="O"
```

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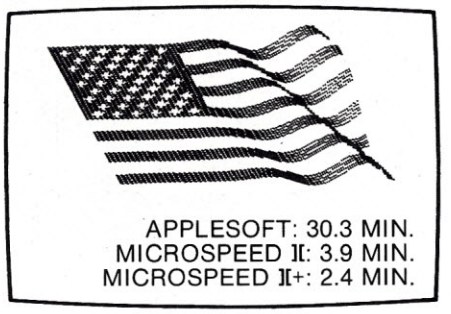
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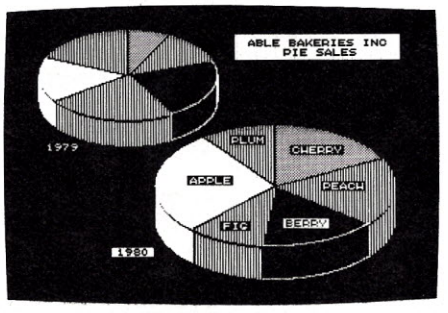
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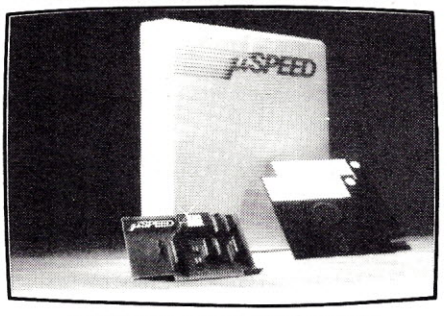
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Listing continued.

```
1054 IF Q$="0" THEN Q$="1"
1058 LET P$=P$+Q$
1060 NEXT X
1062 LET Q$=P$::Re-assignment
1064 LET P$=""
1070 FOR X=1 TO 8
1072 LET P$ = P$ + MID$(Q$,8-X+1,1)
1074 NEXT X
1080 LET P$="#%"+LEFT$(P$,4)+"-"+RIGHT$(P$,4)+"     O=input  1 = output"
1090 RETURN
1099 :
2000 : CA1 or CB1 - inputs only
2001 :
2010 LET P$="00000100"::Bit 2 selects the data register
2012 PRINT "Will you use C";S$;"1 as input interrupt ";:INPUT Q$
2014 IF Q$ = "n" THEN 2090
2016 IF Q$="N" THEN 2090
2026 PRINT
2028 PRINT "There are 4 options to choose from."
2030 PRINT "Remember: C";S$;"1 is input only."
2032 PRINT
2034 PRINT "1. Interrupt on a high-to-low transition- IRQ is diabled."
2036 PRINT "2. Same as 1 but IRQ goes low causing IRQ interrupt to cpu."
2038 PRINT "3. Interrupt on a low-to-high transition - IRQ is disabled."
2040 PRINT "4. Same as 3 except IRQ goes low casuing IRQ interrupt to cpu."
2042 PRINT
2044 INPUT "Make selection ",S
2046 IF S<1 THEN HOME:PRINT CHR$(7):GOTO 2000
2048 IF S>4 THEN HOME:PRINT CHR$(7):GOTO 2000
2050 IF S=1 THEN Q$="00"
2052 IF S=2 THEN Q$="01"
2054 IF S=3 THEN Q$="10"
2056 IF S=4 THEN Q$="11"
2060 LET P$=LEFT$(P$,6)+Q$
2090 RETURN
2099 :
3000 : CA2 or CB2 an an input
3001 :
3010 PRINT "Will C";S$;"2 be used as an input ";:INPUT Q$
3012 IF Q$="n" THEN Q$="N"
3013 IF Q$="N" IF F1 = 0 THEN 3100
3014 IF Q$="N" IF F1 = 1 THEN 3200::CB2 as output
3016 IF Q$="y" THEN Q$="Y"
3018 IF Q$ <> "Y" THEN PRINT CHR$(7):PRINT "RE-ENTER":GOTO 3010
3020 PRINT
3022 PRINT "You may confisure C";S$;"2 as an input in one of the followins ways."
3024 PRINT
3026 PRINT "1. Interrupt on high-to-low transition with IRQ disabled."
3028 PRINT "2. Interrupt on high-to-low transition with IRQ enabled."
3030 PRINT "3. Interrupt on low-to-high transition with IRQ disabled."
3032 PRINT "4. Interrupt on low-to-high transition with IRQ enabled."
3034 PRINT
3036 INPUT "Make selection ",S
3038 IF S < 1 THEN PRINT CHR$(7):PRINT "REENTER":GOTO 3020
3040 IF S > 4 THEN PRINT CHR$(7):PRINT "REENTER":GOTO 3020
3042 IF S = 1 THEN Q$="000"
3044 IF S = 2 THEN Q$="001"
3046 IF S = 3 THEN Q$="010"
3048 IF S = 4 THEN Q$="011"
3060 LET P$=LEFT$(P$,2)+Q$+RIGHT$(P$,3)
3090 IF F1 = 1 THEN 3200
3099 :
3100 : Control of CA2 an an output
3101 :
3110 INPUT "Will CA2 be used an an output ",Q$
3112 IF Q$="n" THEN Q$="N"
3114 IF Q$="N" THEN 3190
3120 PRINT
3122 PRINT "Confisurins CA2 as an output."
3123 PRINT "Note that CRA5 is high."
3124 PRINT
3126 PRINT "1. Goes low on nesative transition of E after a READ operation."
3128 PRINT TAB(4);"Goes hish when CRA-7 is set!"
3130 PRINT "2. Goes low as above. Goes hish on nesative edse of E durins a deselect."
3132 PRINT "3. Goes low when CRA-3 soes low as a result of a WRITE to CRA."
3134 PRINT TAB(4);"Goes hish when a WRITE to CRA sets CRA-3 hish."
3136 PRINT "4. Goes low when a WRITE to CRA sets CRA-3 to low."
3138 PRINT TAB(4);"Goes hish when CRA-3 is set hish as a result of WRITE to CRA."
3140 PRINT
3142 INPUT "Make selection ",S
3144 IF S < 1 THEN 3122
3146 IF S > 4 THEN 3122
3148 IF S = 1 THEN Q$ = "100"
3150 IF S = 2 THEN Q$ = "101"
3152 IF S = 3 THEN Q$ = "110"
3154 IF S = 4 THEN Q$ = "111"
3160 LET P$=LEFT$(P$,2)+Q$+RIGHT$(P$,3)
3190 RETURN
3199 :
3200 : Control of CB2 as an output
3201 :
3210 INPUT "Will CB2 be used an an output ",Q$
3212 IF Q$="n" THEN Q$="N"
3214 IF Q$="N" THEN 3190
```

More →

Listing continued.

```
3222 PRINT "Confisurins CB2 as an output."
3223 PRINT "Note that CRB5 is hish."
3224 PRINT
3226 PRINT "1. Goes low on positive transition of E after a WRITE to DRB."
3228 PRINT TAB(4);"Goes hish when CB1 is set!"
3230 PRINT "2. Goes low as above. Goes hish on positive edse of E durins a deselect."
3232 PRINT "3. Goes low when CRB-3 soes low as a result of a Write to CRB."
3234 PRINT TAB(4);"Goes hish when a WRITE to CRB sets CRB-3 hish."
3236 PRINT "4. Stays hish as lons as CRB3 is hish. Cleared when WRITE to CRB."
3238 PRINT TAB(4);"Goes hish when CRB-3 is set hish as a result of WRITE to CRB."
3240 PRINT
3242 INPUT "Make selection ",S
3244 IF S < 1 THEN 3222
3246 IF S > 4 THEN 3222
3250 GOTO 3148
3299 :
8000 : The code
8001 :
8010 PRINT #@
8020 PRINT #@,TAB(10);C$;TAB(20);P$
8080 PRINT #@
8090 RETURN
8099 :
9700 : Test for Side B
9701 :
9710 INPUT "Do you want to confisure Side B of the PIA ",@$
9712 IF @$ = "n" THEN @$ = "N"
9714 IF @$ = "N" THEN F1 = 2 : GOTO 9790
9720 LET F1 = 1::Side B flas
9790 RETURN
9799 :
9800 : Initialize the prosram variables
9801 :
9810 STRING= 50
9812 LINE= 0::Unlock the line-feed/carriase return format
9814 LET W=35
9816 LET F1 = 0::Flas for Side A or Side B of the PIA
9820 LET T$ = "PIA Initialization"
9840 INPUT "Which port for output ",@
9842 IF @ <> 3 THEN @ = 1
9890 RETURN
9899 :
```


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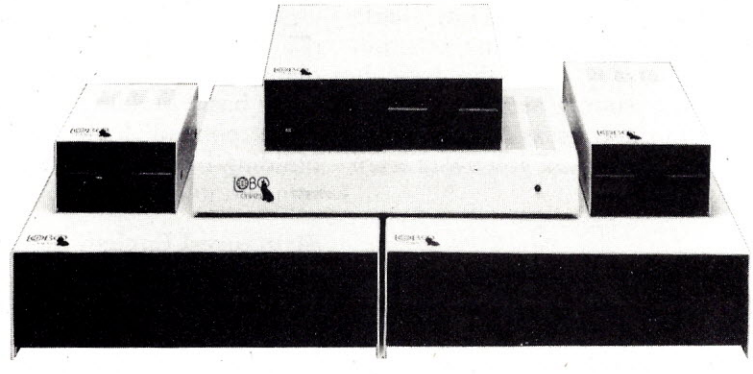
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Don't become sidetracked when designing and developing programs. With Structured English, you can concentrate on program logic, separate from other concerns.

Designer's Delight

By David Carew

Why pseudocode? Well, pseudocode is to modern structured programming roughly what flow charts were supposed to be to old-style, natural programming methods. The fact is that complex computer programs are not written into existence, they are designed and developed into existence by a process involving successive levels of consideration and separation of concerns. Flow charts were often advised and too seldom used in this process, for a number of good reasons.

If you stop and think about it, and especially if you have ever tried flow charting, you will realize that the only way to draw a readable flow chart is to (1) know exactly where you are going beforehand, and (2) be very careful even then. Flow charts are excellent for depicting program logic graphically after the logic is done. They simply aren't very productive in the process of developing that logic. They lead you away from the problems of coding logic, into a separate little world of boxes and tiny arrows.

Instead, the program designer wants something he can write the way he writes a programming language, something which embodies the program logic exactly as it will be in the program, but which does not embroil him in the details of the syntax and grammar of some specific compiler or interpreter. These details are a separate concern which he must deal with at a different level of consideration.

If you set aside the concerns attendant to flow chart graphics and actual language implementations, the remaining essentials can be made quite simple. Any algorithm which can be written for a Turing machine (a simple mathematical model of a computer) can be written using only three basic building blocks for program control logic. Those three building blocks are sequence, selection and iteration.

Structured English

An ideal tool for designing the logical flow of a program would use simple conventions for depicting these basic building blocks, and give the programmer as much freedom as possible beyond that. One such tool is called Structured English, which is the simplest kind of pseudocode. Pseudocode is a general term for any of several systems of conventions which let programmers think about and specify the control logic of a program without wasting time on implementation details.

To see how Structured English (and other pseudocode) works, you must examine in detail the three basic control structures for program logic: sequence, selection and iteration. It is perhaps ironic that the best way of describing them precisely is to use flow charting.

Sequence

Logical sequence is simply specifying the order of execution of algorithm steps. In this form, pseudocode specifies order of execution in exactly the same way as Basic and most other implementation languages: by

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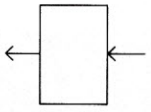


Fig. 1. A single flow-chart sequence box.

```
IF      (condition test) THEN
        (stmt A)
        (process B)
          .
          .
          .
        (stmt n)
ELSE
        (stmt X)
        (process Y)
          .
          .
          .
        (stmt n)
ENDIF
```

Fig. 2. Structured English construct showing logical selection.

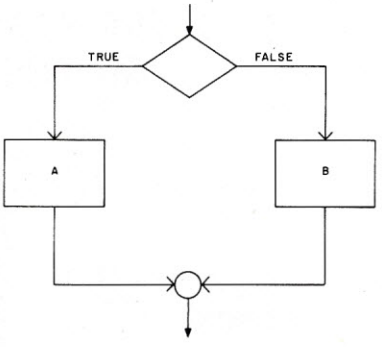


Fig. 3. Flow chart of the logical selection construct shown in Fig. 2.

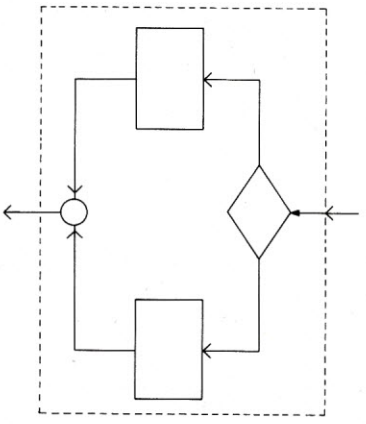


Fig. 4. The construct in Fig. 3 can become a single process block.

lexicographical precedence. In other words, unless the other two logical control forms intervene, things are done in the order they are written.

Structured English lets any English language declarative or imperative sentence be a "step." However, as with Basic and many other computer languages, Structured English pseudocode allows a given sequence to be physically elsewhere and executed by reference. In Basic this is the GOSUB statement; Structured English CALLs things by title. For an example, see Listing 1.

The empty flow chart box in Fig. 1 illustrates what is meant by levels of consideration in attacking a problem with sequence, selection and iteration as logical control forms. Depending on your level of consideration at the moment, a single flow-chart sequence box could contain a single step or any number of steps or called sequences. It could also contain any number of instances of the other control forms of selection and iteration. All of these execute as one unit, a single step at our current level of consideration.

However, some conditions must be met if a block of multiple steps is to execute as a single step at some higher level of consideration. First, there must be exactly one entry point and one exit point for all executions of the block; no GOTO jumps into or out of locations in the middle of the block can be used.

Second, if more than one logical state of the process can exist as execution begins at the block entry point, then each allowed state must be explicitly expressed as data, with each unit of data having a rigid meaning. The block must operate within a little universe completely defined by the values of certain prearranged data points (often called parameters or arguments).

Next, as with entry to the block, if multiple results are to be allowed

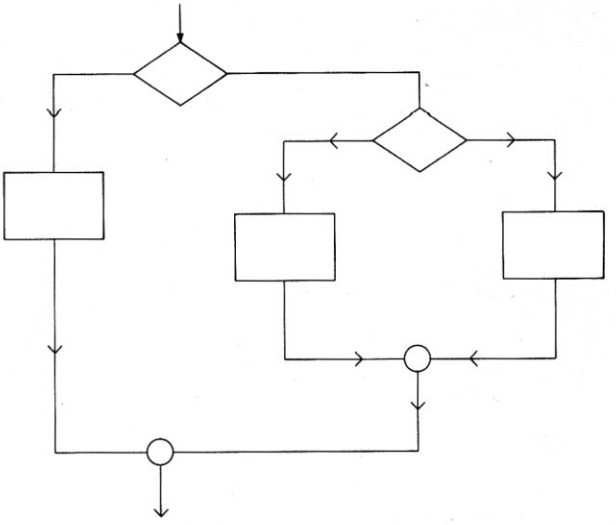
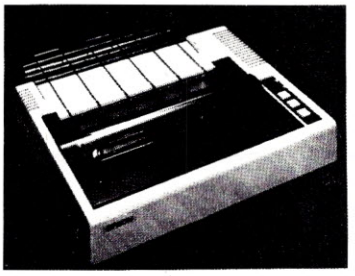


Fig. 5. A control mechanism incorporating Fig. 4 as a single process block.

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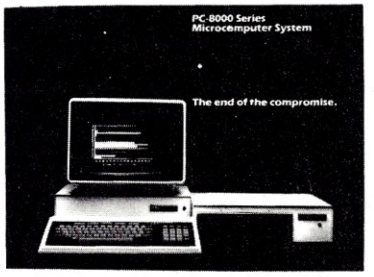


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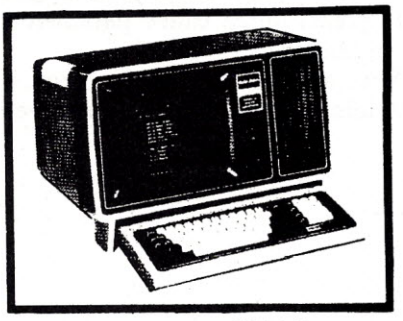
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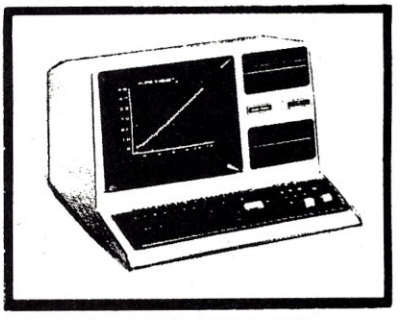
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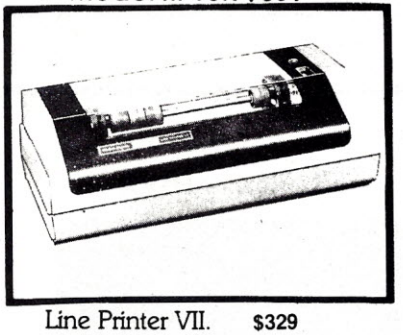
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through the one exit point, each allowable result must be expressed as a particular data value or collection of data values; the block is said to "return" these values. If a block retains the characteristics absolutely, it can be safely thought of as a single step on the road to some other goal.

These realizations are not so much a part of pseudocode as they are fundamental ideas in using pseudocode (and other design tools for that matter) to attack a problem one level at a time, refining your ideas into more and more detail as you proceed.

Selection

Logical selection is the next basic logical control form requiring a construct in Structured English pseudocode. Logical selection is sometimes called alternation or conditional branching. The construct in Structured English is shown in Fig. 2.

Actual statements or called processes are indented within the construction, so that the control of their execution is made plain. Using process block A for any number of steps associated with the THEN clause, and process block B for any number of steps associated with the ELSE clause, the flow chart for this Structured English construct appears in Fig. 3. Notice that at another level of consideration, the entire construct can be thought of as a single process block (see Fig. 4).

Considered as a single block, this fundamental control construct can be made one of the alternatives of another logical selection, creating a control mechanism as illustrated by the flow

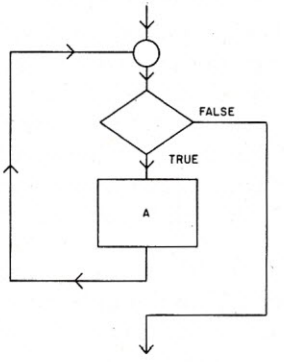


Fig. 6. Logical iteration control construct designating DO-WHILE.

```
AFTER-DINNER-PROC
HELP YOUR WIFE WITH DISHES
WATCH SOME IDIOT TUBE
CALL WALKING-THE-DOG
PREPARE FOR BEDDY-BYE
GO TO SLEEP
ENDPROC

WALKING-THE-DOG
FETCH THE LEASH
GET YOUR DOG
LEASH YOUR DOG
GO OUTSIDE
CALL WALK-AROUND-BLOCK-ONCE
CALL WALK-AROUND-BLOCK-ONCE
GO INSIDE
UNLEASH DOG
PUT AWAY LEASH
ENDPROC;(RETURN)
```

Sample listing 1. Structured English pseudocode.

```
WATCHING TELEVISION
CALL GETTING TV READY
GLUE YOUR EYES TO THE TUBE
WITH SLIGHTLY PARTED LIPS, WATCH AND LISTEN TO EVENTS THERE
IF THE URGE STRIKES YOU THEN
    SIP BEER
    EAT PRETZELS
ENDIF
IF  THERE IS A COMMERCIAL BREAK THEN
    IF NATURE CALLS THEN
        GO TO THE BATHROOM
    ENDIF
ELSE
    IF YOU ARE LOW ON BEER AND PRETZELS THEN
        SIGH HEAVILY ABOUT HOW TOUGH LIFE IS
        GET MORE BEER
        GET MORE PRETZELS
    ENDIF
ENDIF
ENDPROC
```

Sample listing 2. A program with successive indentation to effect control structures.

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chart in Fig. 5. Control structures like this are created in Structured English by simply nesting IF-THEN-ELSE constructs one inside another, using successive indentation to make control clauses plain. Obviously, such nesting is limited only by the requirements of the problem under attack. An example of Structured English pseudocode which illustrates both nested logical selection and logical selection with a null (omitted) ELSE clause is presented in Listing 2.

Iteration

The final control construct, logical iteration, is a bit more involved in that there are two kinds of iteration control constructs designated in Structured English: DO-UNTIL and DO-WHILE. The flow chart graphics (Figs. 6 and 7) no doubt suggested the term "loop" for an iteration construct.

DO-WHILE (see Fig. 6) will continue executing and re-executing steps in the process A as long as the condition remains true. Note that the condition is tested *before* execution of A, so that if the condition is false the first time it is tested, then the process A is not executed at all.

This is in direct contrast to the alternate DO-UNTIL construct (see Fig. 7) where the control condition is tested *after* execution of the process in the loop, so that the process must always execute at least once.

By convention, DO-WHILE stops

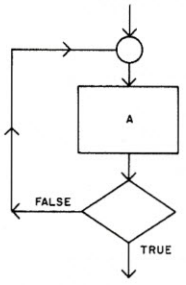


Fig. 7. Logical iteration control construct designating DO-UNTIL.

CROSSING THE STREET

```
DO WHILE CROSSWALK LIGHT SAYS DONT WALK
    WAIT ON THE CURB 10 SECONDS
    TWIDDLE THUMBS AND SIGH
ENDDO
LOOK RIGHT
LOOK LEFT
IF COAST IS CLEAR THEN
    STEP OFF CURB
    DO UNTIL YOU HAVE REACHED THE FAR CURB
        QUICKLY TAKE A STEP TOWARD FAR CURB
    ENDDO
    STEP UP ON FAR CURB
ENDIF
ENDPROC
```

Sample listing 3. A pseudocode listing using both kinds of DO constructs.

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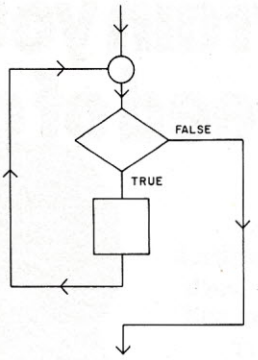
iteration (exits the loop) with the test condition False, and DO-UNTIL stops iteration with the test condition True. Also notice each of these constructs can itself be considered one process block and thus nested within another DO construct or made part of an ELSE or a THEN clause of an IF construct. The possibilities are endless: some combination of these control forms is sufficient to any possible problem that can be solved by a computer.

Structured English forms of these constructs (given in Fig. 8) are much alike, and it pays to keep in mind that the differences can be quite significant to your algorithm.

Some commonly occurring control structures, which would otherwise have to be built from a combination of the fundamental ones shown in Listing 3, are often, for convenience, given their own names and conventions in the more sophisticated pseudocodes. Possibly the most widely recognized of these is the mul-

```
DO WHILE (Condition Test)
  (step or process 1)      Execute
                          > while
                          > Condition is
  (step or process n)      True
ENDDO
DO UNTIL (Condition Test)
  (step or process 1)      Execute
                          > until
                          > Condition is
  (step or process n)      True
ENDDO
```

Fig. 8. Structured English forms of the DO-WHILE and DO-UNTIL logical iteration control constructs.



Line Numbers	Statements
AAAA	REM DO WHILE
XXXX	IF [condition test] THEN GOTO YYYY
	GOTO ZZZZ
YYYY	REM BEGIN ITERATION PROCESS HERE
	↓
	GOTO XXXX
ZZZZ	REM ENDDO

Fig. 9. A Basic implementation of the Structured English DO-WHILE construct.

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tiple-branching CASE statement, which works like the Basic language ON-GOSUB.

CASE (*PROC-ONE, PROC-TWO, . . . PROC-N)* of CTL-VAR will CALL *PROC-ONE* if CTL-VAR is 1, CALL *PROC-TWO* IF CTL-VAR equals 2, and so forth. You could easily build an equivalent out of a series of IF tests. Extensions beyond this tend to bog the logic designer down in the baggage of syntax and conventional-use rules.

The Ultimate Freedom

I've suggested some correct, by-the-book reasons for use of pseudocode in algorithm design, and now I'd like to offer the one that could be the clincher for the hobbyist on a budget: pseudocode is the ultimate freedom from hardware costs. If you are a programming-oriented computerist, here is your chance to write and debug complete, actual programs while you are still saving up for your machine. After a surprisingly easy translation into computer code, such programs will run on your hardware when you get it.

To emphasize the freedom you have in Structured English pseudocode, I have given non-machine algorithms as sample listings.

I'll conclude by examining a pseudocode routine for executing a binary search, which is the quickest way to find the position of a particular item in an ordered (sorted) set of items. You could search the set of items starting at one end and comparing each item until you found the position of an item matching our particular item, but this would be slow.

Instead, knowing the items are in order, you guess your particular item is in the exact middle of the ordered set. If it is, great; you found it with only one access action on the set. If

```
OBTAIN: [TARGET-KEY, DATASET, SIZE-OF-SET, BEGINNING-OF-SET]
UPPER = SIZE-OF-SET
LOWER = BEGINNING-OF-SET
MID = INTEGER OF [(UPPER + LOWER)/2]
DO UNTIL [DATASET AT MID = TARGET-KEY] OR [UPPER = LOWER]
    IF [TARGET-KEY<DATASET AT MID] THEN
        UPPER = MID - 1
    ELSE
        LOWER = MID + 1
    ENDIF
    MID = INTEGER OF [(UPPER + LOWER)/2]
ENDDO
IF [DATASET AT MID = TARGET-KEY] THEN
      EXIT  FOUNDIT  AT MID
ELSE
      EXIT  NOFIND
ENDIF
ENDPROC; [RETURN]
```

Sample listing 4. Binary search pseudocode.

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the middle item is larger than your particular item, then you know all the items after the middle item are also too large. If the middle item is smaller, then so are all the items before it in the set.

In either case, you have eliminated one half of all possible positions. So, take the remaining half and guess again in the middle. Each time, you either find the position of the matching item or eliminate one half of all remaining possibilities—the search narrows rapidly.

This technique is ubiquitous in computer application software, and familiarity with it can be something of a touchstone. I once failed a job interview largely because I did not recognize at a glance that a particular subroutine was executing a binary search (or rather, I saw what was going on, but I didn't use the magic phrase *binary search*).

The pseudocode routine in Listing 4 is a machine algorithm, and as such uses variables and assumes fairly rigidly definable steps. There is no need to get overly rigorous about this. You can borrow the Boolean, arithmetic and variable conventions (real, integer, acceptable ranges, etc.) from whatever computer language you intend to ultimately implement. It is better to use long English variable names even though the intended implementation language may not allow this.

Even a fairly crude and loosely used pseudocode can be an accurate and understandable model of machine procedure. For instance, can you tell from examining Listing 4 whether this routine would find the position of a target item if it happened to be either the first item or the last item on the list? Examine the routine for other possible bugs and ask youself how you might translate this to a Basic routine searching a disk file.■

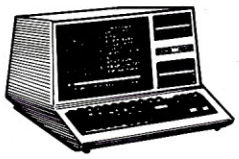
```
Line Numbers   Statements
AAAA           REM DO UNTIL (use Step 0 below if allowed)
BBBB           FOR J=0 to 32765 Step .000001
               REM   BEGIN PROCESS TO ITERATE HERE
                     ↓
               IF [condition test] THEN J=32767
               NEXT J
ZZZZ           REM END DO
```

Fig. 10. The Structured English DO-UNTIL construct might be implemented like this in Basic.

```
Line Numbers   Statements
XXXX           IF (condition test) THEN GOTO YYYY
               REM    ELSE CLAUSE HERE
                      ↓
               GOTO ZZZZ
YYYY           REM    THEN CLAUSE HERE
                      ↓
ZZZZ           RM ENDIF
```

Fig. 11. This is how the Structured English IF-THEN-ELSE construct might be implemented in Basic.

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Here's a Basic program that will let you print customized invoices using your North Star Horizon.

Thank You for Your Order

By Gary E. Nelson

For many small businesses, producing invoices can be a time-consuming process—especially if all invoices must be typed by a secretary or written out. This program produces flexible, general-purpose, professional-quality invoices.

Since I print invoices for a couple of local mail-order firms, I needed a general-purpose form that would satisfy my own requirements as well as those of my customers. This program should also be useful to those who do not write enough invoices to justify the cost of custom-printed forms.

Using the Program

As indicated in the Sample run, the program prompts all necessary inputs. All entries are single-prompt single-entry. The REMARKS prompt is meant to contain the customer's resale tax number, if applicable, or any other pertinent data you may wish to include. Any prompts for information not relevant to the invoice being produced should be answered with NA for not applicable, or by hitting the carriage return. All entries are completed with a carriage return.

The program begins by prompting for the date and the invoice number. It then requests the operator to enter the company number. This feature lets you put the names and addresses of different companies into a file that can be retrieved by an identifying number. I found that this was much easier than typing the company name and address for each invoice being printed, especially when printing a number of invoices for the same firm.

Entering a 0 indicates that the company name is not on file and the operator is requested to enter the new company name and address. If a number is entered which corresponds to one contained on file, the program uses the data from the file.

Adding companies to or subtracting them from the file is explained later. The program will then prompt for the name and address of the customer and ask if the order is to be shipped to the same place. If the shipping address is different, the program will prompt for the correct one.

The user is then asked to enter the customer's PO number, terms, method of shipment, etc. Responses to any prompts not applicable to the invoice being generated should be answered by hitting the carriage return or by entering NA. When the preceding entries have been made, the program requests the information for the ordered items.

After the information for each item has been received, the program will ask if any more items are to be included on the invoice. If you want to have more than ten line items on your invoices, the DIM statement in line 0010 can be altered to accommodate this. Just change the dimensions of D$, P, Q and QS to reflect the number of line items desired.

Shipping and handling fees are entered next, followed by the amount that was received, if any, as deposit or prepayment. The user is then asked if a sales tax is to be added to the invoice, and if the extended price is to be computed for the quantity ordered or the quantity shipped. If the order was prepaid, you may want to use the quantity ordered—assuming that you are going to ship the back-ordered items as soon as possible. Otherwise the extension column should be calculated using the quantity shipped. Entering a 1 causes the quantity ordered to be used, while entering a 2 causes the quantity shipped to be used.

Finally, the program asks how many copies of the invoice are to be printed. Enter a 1 if you want to print a multicarbon form or if you want several copies but need to load the paper into your printer for each invoice. After all of the copies have been printed, the program will ask if any more copies are desired.

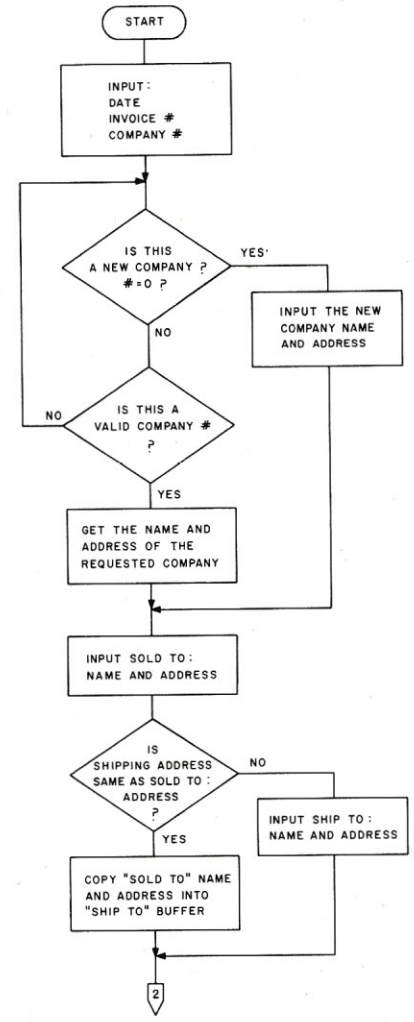
The Program

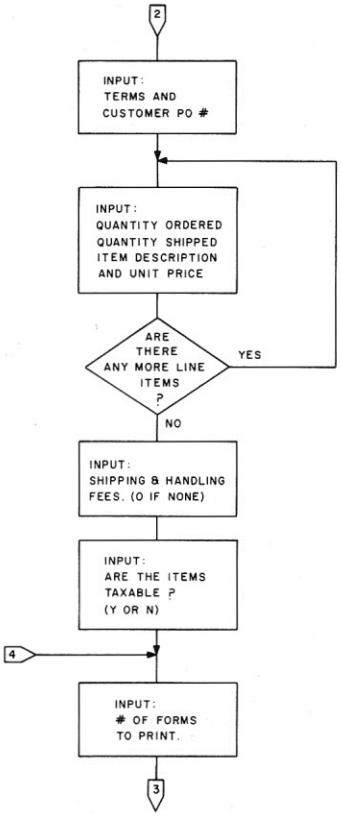
Invoice was written on a North Star Horizon using CBasic2. It should adapt easily to other Basics having PRINT USING statements, string variables and one-dimensional arrays. Multiple statements on a single line are used with a colon separating each part. A continuation character (\) is used wherever a statement takes more than one line. CBasic2 does not require line numbers unless the statement is referenced elsewhere in the program. If your Basic requires line numbers you will have to insert them in front of the unnumbered statements.

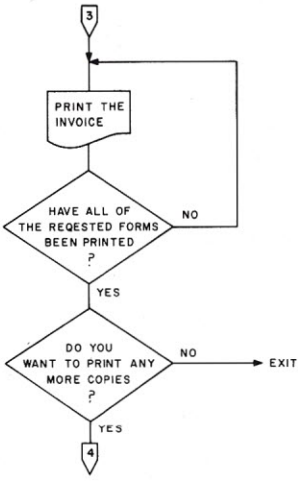
The program was constructed to permit a maximum of ten line items on a single form. If you want to increase or decrease the number of line items to be contained on a single invoice, alter the dimensions of D$, Q, P and QS in line 0010 to whatever number of items are desired. For 15 line items change the array dimensions as follows: D$(15),Q(15),P(15), QS(15).

Line 0025 contains the maximum number of companies contained in the file starting at line 1000. As com-

Address correspondence to Gary E. Nelson, 13450 Maxella Ave., G185, Suite 142, Marina Del Rey, CA 90291.







Program flowchart.

panies are added to or deleted from the file, NO.OF.COMPANIES% must be altered to reflect the change. Thus, if a company number is entered that is greater than the number of companies on file, statement number 0190 will prompt the operator to enter another number. Company names are added to the file by appending the statement number of the routine which loads the array "A$" to the ON GOSUB statement in line 1000. For example:

```
1040 A$(1)="Company name"
     A$(2)="Street address"
     A$(3)="City":A$(4)="State Zip"
     A$(5)="Phone number"
```

Then add ",1040" to the end of line 1000. In this case the new company will be company number 3.

If you don't want to use the multicompany name call-up feature, delete line 0025, lines 0175 through 0195 and lines 1000 through 1035. You will then be prompted to enter the company name and address for each invoice. If you plan to use only one company name and don't want to enter it each time you run the program, change lines 0200 through 0225 as follows:

```
0200 A$(1)="Company name"
0210 A$(2)="Street address"
0220 A$(3)="City":A$(4)="State Zip"
0225 A$(5)="Phone number"
```

Statement 0450 directs the outputs of all PRINT statements to the printer port, and statement number 0970 redirects them to the terminal. If you are using a different Basic, these lines can be substituted with "PORT=" statements containing the appropriate port addresses for your system. Statements 0455 and 0475 are format controls for the TI 820RO printer with the compressed print op-

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15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
99	RRCONVBD	Investor's rate of return on convertable bond
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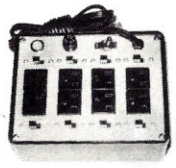
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tion and should be deleted if your printer doesn't recognize those configuration strings.

Statement 0455 puts the printer into the expanded print mode so that the heading "INVOICE" will be printed in double-width characters (five characters per inch (cpi)). Statement 0470 returns the printer back to the normal (10 cpi) mode. Delete these lines and change line 0470 to "PRINT TAB(25);"***INVOICE***":PRINT:PRINT if you are not using a TI printer with the compressed print option installed. Line 0460 outputs a form feed to the printer. If your printer doesn't recognize this control character, you can replace it with a GOSUB statement which transfers control to a subroutine that will output an appropriate number of line feeds, as shown in the following example:

```
2000 FOR I=1 TO 15
2005 PRINT CHR$(n)
2010 NEXT I
2015 RETURN
```

Statements 0510 through 0540 cause the invoicing company's name, address and phone number to be centered when printed on 80-column paper. Statement 0870 checks to see if the invoice items are subject to sales tax, and multiplies the total by .06 if they are. California has a 6 percent sales tax—if your sales tax differs, replace the .06 in statement 0870 with the appropriate rate. If you are one of those fortunate souls living in an area that doesn't have any sales tax, delete statements 0370, 0870, 0875 and 0878.■

Program listing. Invoice program written on a North Star Horizon using CBasic2.

```
 1: \*******************************************************
 2: \*                                                     *
 3: \*                    INVOICE                          *
 4: \*                                                     *
 5: \*              NELSON MICROSYSTEMS                    *
 6: \*                 GARY E. NELSON                      *
 7: \*              13450 MAXELLA AVENUE                   *
 8: \*               G185      SUITE 142                   *
 9: \*              MARINA DEL REY, CALIF. 90291           *
10: \*                  (213) 204-0523                     *
11: \*                                                     *
12: \*******************************************************
13: REM
14: REM
15* 0010 DIM A$(12),B$(4),C$(4),D$(10),P(10),Q(10),QS(10)
16* 0025 NO.OF.COMPANIES%=2: REM  # ON FILE
17* 0030 E$="----------"
18* 0040 FOR$="$$##,###.##"
19* 0050 FOR1$="###.##"
20* 0060 FOR2$="##,###.##"
21* 0070 FOR3$="###"
22* 0140 INPUT "INVOICE NUMBER";A$(7)
23* 0150 A$(7)="INVOICE NO: "+A$(7)
24* 0160 INPUT "TODAY'S DATE (D-M-Y)";D$
25: 0175 INPUT "COMPANY NUMBER (0 =NEW)";N
26* 0180 IF N=0 THEN 0200
27* 0190 IF N > NO.OF.COMPANIES% THEN GOTO 0175
28* 0195 GOTO 1000
29: 0200 INPUT "NAME";A$(1)
30* 0210 INPUT "STREET ADDRESS";A$(2)
31* 0220 INPUT "CITY";A$(3)
32:      INPUT "STATE  ZIP";A$(4)
33* 0225 INPUT "PHONE #: ";A$(5)
34: 0230 PRINT
35* 0250 INPUT "SOLD TO:";B$(1)
36* 0260 INPUT "STREET ADDRESS";B$(2)
37* 0270 INPUT "CITY";B$(3)
38:      INPUT "STATE  ZIP";B$(4)
39:        PRINT
40:        INPUT "SHIP TO SAME ADDRESS?";Z$
41:        IF Z$<>"Y" THEN 0275
42:        FOR I = 1 TO 4
43:        C$(I)=B$(I)
44:        NEXT I
45:        GOTO 0277
46: 0275 INPUT "SHIP TO: ";C$(1)
47:        INPUT "STREET ADDRESS";C$(2)
48:        INPUT "CITY";C$(3)
49:         INPUT "STATE  ZIP";C$(4)
50: 0277 INPUT "TERMS: ";LINE A$(6)
51:      INPUT "CUSTOMER'S ORDER # ";LINE A$(8)
52* 0280 PRINT
```

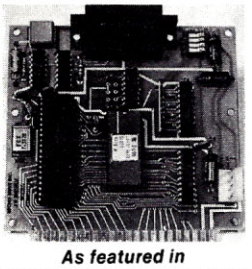
More

Listing continued.

```
53* 0300 J=1
54: 0320 INPUT "QUANTITY ORDERED";Q(J)
55* 0325 INPUT "QUANTITY SHIPPED";QS(J)
56* 0330 INPUT "DESCRIPTION ";D$(J)
57* 0340 INPUT "UNIT PRICE ";P(J)
58* 0350 INPUT "ANY MORE ITEMS?";Z$
59:      IF Z$="N" THEN 0360
60:        J=J+1:N=J:GOTO 0320
61: 0360 PRINT
62:      INPUT "SHIPPING & HANDLING FEE";S
63* 0370 INPUT "TAXABLE? (Y OR N)";X$
64:      INPUT "SHIP VIA:";LINE A$(9)
65:      INPUT "FOB";LINE A$(10)
66:      INPUT "REMARKS";LINE A$(11)
67* 0390 INPUT "AMOUNT RECEIVED (0 IF NONE)";D
68: 0395 INPUT "ARE $ TOTALS FOR (1)QUANT. ORDERED OR (2)QUANT. SHIPPED";F
69: IF F=1 THEN 0400
70: IF F<>2 THEN 0395
71: 0400 INPUT "HOW MANY COPIES?";C
72:      FOR I=1 TO C
73* 0450 LPRINTER WIDTH 80
74* 0455 PRINT CHR$(27);CHR$(80);CHR$(73);CHR$(27);CHR$(92)
75* 0460 PRINT CHR$(12)
76* 0470 PRINT TAB(16);"INVOICE":PRINT:PRINT
77* 0475 PRINT CHR$(27);CHR$(80);CHR$(67);CHR$(92);
78* 0480 PRINT A$(7);
79* 0490 PRINT TAB(79-LEN(D$));D$
80* 0500 PRINT:PRINT
81* 0510 PRINT TAB(40-((LEN(A$(1)))/2));A$(1)
82* 0520 PRINT TAB(40-((LEN(A$(2)))/2));A$(2)
83* 0530 PRINT TAB(40-(((LEN(A$(3)+A$(4)))+2)/2));A$(3);", ";A$(4)
84* 0540 PRINT TAB(40-((LEN(A$(5)))/2));A$(5)
85* 0560 PRINT :PRINT :PRINT
86* 0570 PRINT "SOLD TO:";TAB(41);"SHIP TO:"
87: PRINT TAB(5);B$(1);TAB(45);C$(1)
88: PRINT TAB(5);B$(2);TAB(45);C$(2)
```

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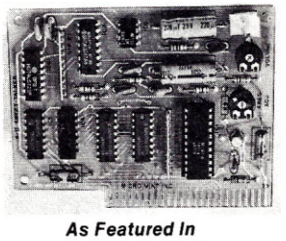
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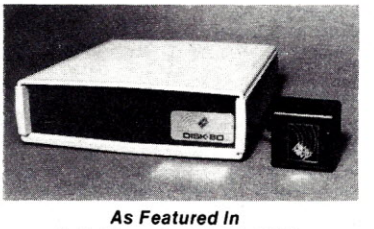
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Listing continued.

```
 89: PRINT TAB(5);B$(3);", ";B$(4);TAB(45);C$(3);", ";C$(4)
 90: PRINT
 91: PRINT E$;E$;E$;E$;E$;E$;E$;E$;
 92:       PRINT "CUST PO:";TAB(15);"TERMS:";TAB(30);"SHIP VIA:";
 93:       PRINT TAB(45);"FOB:";TAB(60);"REMARKS:"
 94:       PRINT A$(8);TAB(15);A$(6);TAB(30);A$(9);TAB(45);A$(10);
 95:       PRINT TAB(60);A$(11)
 96: PRINT E$;E$;E$;E$;E$;E$;E$;E$
 97* 0640 PRINT TAB(4);"QUANTITY"
 98* 0645 PRINT "ORD  SHIP  B.O.";
 99* 0650 PRINT TAB(25);"DESCRIPTION";
100* 0660 PRINT TAB(55);"UNIT PRICE";
101* 0670 PRINT TAB(70);"EXTENSION"
102: PRINT
103* 0690 T=0  REM CLEAR SALES TAX VARIABLE
104* 0700 FOR J=1 TO N
105* 0720 PRINT USING FOR3$;Q(J);TAB(6);QS(J);TAB(12);Q(J)-QS(J);
106* 0730 PRINT TAB(18);D$(J);
107* 0750 PRINT TAB(58);:PRINT USING FOR1$;P(J);
108* 0755 IF F=1 THEN GOTO 0760
109:       P=QS(J)*P(J):GOTO 0770
110: 0760 P=Q(J)*P(J)
111: 0770 PRINT TAB(70);:PRINT USING FOR2$;P
112* 0780 T=T+P
113* 0800 NEXT J
114* 0810 PRINT TAB(70);E$
115* 0820 PRINT TAB(55);"TOTAL";
116* 0830 PRINT TAB(68);:PRINT USING FOR$;T
117* 0840 PRINT :PRINT TAB(40);"SHIPPING & HANDLING";
118* 0850 PRINT TAB(73);:PRINT USING FOR1$;S
119* 0870 IF LEFT$(X$,1)="Y" THEN X=.06*T
120* 0875 PRINT TAB(40);"SALES TAX";TAB(73);
121* 0878 PRINT USING FOR1$;X
122:       PRINT TAB(40);"AMOUNT RECEIVED";TAB(70);
123:       PRINT USING FOR2$;D
```

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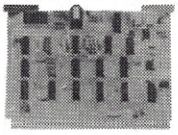
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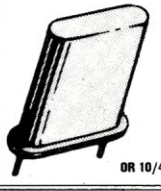
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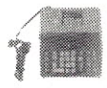
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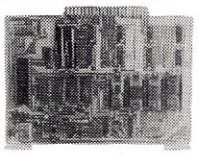
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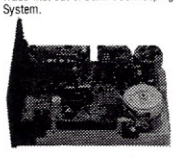


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Listing continued.

```
124* 0880 PRINT TAB(70);E$
125* 0890 PRINT TAB(55);"TOTAL DUE";
126* 0900 PRINT TAB(68);:PRINT USING FOR$;(S+T+X)-D
127* 0910 PRINT TAB(70);"==========="
128: PRINT "(B.O.) Back orders will be filled as "
129: PRINT "        as possible."
130: PRINT
131: PRINT "* A late payment charge if 1.5% per month"
132: PRINT "(18% ANNUALLY) will be applied on all past"
133: PRINT "due accounts."
134: PRINT
135: PRINT TAB(28);"THANK YOU FOR YOUR ORDER"
136:       NEXT I
137* 0970 CONSOLE
138* 0980 INPUT "MORE COPIES?";Z$
139* 0990 IF LEFT$(Z$,1)="Y" THEN 0400
140* 0995 GOTO 1999
141: REM NO.OF.COMPANIES% MUST BE ALTERED IF THIS LIST IS CHANGED
142: 1000 ON N GOSUB 1020,1030
143* 1010 GOTO 0230
144: 1020 A$(1)="ABC SYSTEMS INC."
145:      A$(2)="7422 OVERLAND AVE.  SUITE #8138"
146:      A$(3)="LOS ANGELES":A$(4)="CALIF.  90034"
147:      A$(5)="(213) 123-4567"
148* 1025 RETURN
149: 1030 A$(1)="BCD ELECTRONICS"
150:      A$(2)="10234 LINCOLN BLVD"
151:      A$(3)="SANTA MONICA":A$(4)="CALIF.  90028"
152:      A$(5)="(213) 222-3422"
153* 1035 RETURN
154: 1999 END
NO ERRORS DETECTED
CONSTANT AREA:      16
CODE SIZE:        2780
DATA STMT AREA:      0
VARIABLE AREA:     208
```


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This "friendly" word processor for the Atari is so easy to use and is such a time-saver that you may feel you have an unfair advantage.

Freedom from Text Editor Tyranny

By Kent A. Multer

I had my first experience with word processing as a student. The school's PDP-10 had a program called RUNOFF, which saved me countless hours of typing and retyping whenever I had to do a term paper or other lengthy report. The program automatically double- or triple-spaced, indented, and would even put the page number and report title at the top of each page.

This program enabled my fellow students and me to produce such fine reports, with so little work, that it attracted the attention of one of the deans of the school. His impression was not good; in fact, he tried to ban students from using it! He thought that using the computer as a super-typewriter gave us an unfair advantage. Fortunately, wiser heads prevailed and the ban was never imposed.

Kent Multer (PO Box 732, W. Acton, MA 01720) wrote his first computer game in 1970, at the age of 14. After finishing school, where he majored in computer science, he worked as a programmer and technical writer at Data General. He has also worked as an R&D project engineer at the Milton Bradley Company, where he designed electronic games and toys.

Science marches on, and in 1981 we find that the Atari computer, with the help of an Epson MX-70 or MX-80 printer, can process words as well as the old PDP-10.

This micro-RUNOFF program will let you prepare your own high-quality documents. You prepare your document, either as a disk or cassette file, or as a set of DATA statements that go right into memory along with the program. The document consists of your text, interspersed with special characters and command words that control RUNOFF's various features.

How RUNOFF Handles Words

The biggest problem with most text editors is that if you add or remove a few words after you type something in, you end up with one line that's longer or shorter than the others in the paragraph. RUNOFF's most important function is to solve that problem by filling each line with as many words as there is room for.

To do this, the program largely ignores the spaces and carriage returns in the input text. Specifically, RUNOFF considers carriage returns and spaces to be equivalent, and it considers two or more of them in a row to be equivalent to a single one. The result is that RUNOFF converts the text into a stream of *words*, with the stuff between the words not being very important.

Special Characters

You're free from the tyranny of the text editor, but there's one small problem. At times you'll *want* to insert spaces or carriage returns. In such a case, you can use the appropriate special characters. The character "^" (called up-arrow, circumflex or caret) is converted to a blank space, and sidesteps RUNOFF's usual handling. The "%" character forces RUNOFF to end the current line of text, even if it isn't full.

The "%" must occur as a word; i.e., with a blank or carriage return on each side. I generally use "% %" at the end of each paragraph: that causes RUNOFF to leave a line blank. If I want two blank lines, I type "% % %".

Margin Setting and Indenting

The Epson printers put 80 characters on a line, and RUNOFF normally fits words into that width. You can move the left and right margins by putting the "%LM" and "%RM" commands in your text. For example,

you might want to print a business letter with one-inch-wide margins. Since the printer prints ten characters per inch, you put "%LM 11 %RM 70" at the beginning of the letter. Characters 1 through 10 and 71 through 80 will be left blank.

To indent a single line, such as the first line of a paragraph, use the "%INDENT" command. It makes a temporary margin change, which lasts only until the current line is printed. For example, "%INDENT 4" will cause one line of text to have set its left margin four spaces to the right of whatever your regular margin is. Similarly, "%INDENT -4" will produce a hanging indent. Hanging indents are handy for lists of items, as shown in the Sample run.

There is another type of indenting available to you with the "%CENTER" and "%ENDC" commands. After reading a "%CENTER" command, RUNOFF will center each line. This is useful for titles and advertising copy. The "%ENDC" command turns off the centering function.

Vertical Spacing Control

If you're writing a term paper or a manuscript for a book or magazine, you probably want to use double or triple spacing. You can control line spacing with the "%VS" command.

The printer can be set to move from 1/72 to 85/72 of an inch each time it prints a line. The standard line spacing is 1/6 of an inch, or 12/72, and RUNOFF will normally use that spacing. For a double-spaced printout, put "%VS 24" in your document. For triple spacing, put "% 36". To return to standard spacing, put "%VS 12".

You can use "%VS" with any number from 0 to 85. With zero spacing, the paper does not move at all. This

```
                                8 Norton Ct.
                                Easthampton, MA      01027

                                16-Apr-81


    Dear reader,

    This letter will introduce you to RUNOFF, a word
processing program for the Atari personal computer and the
Epson MX80 or MX70 printer. Its features include:

        1. Fitting lines of text to your specified
           left and right margins.

        2. Variable vertical spacing.

        3. Changing from normal to e x t r a
           w i d e characters on command.

        4. Automatic end-of-page processing, with
           options such as numbering the pages, or
           putting a title at the top of each.


    All in all, this program should make it easy for you to
prepare high-quality letters, reports, and documents of all
types. I hope you enjoy it.

                                Sincerely,


                                Kent Multer
```

Sample run. (See lines 100 to 270 of the program.)

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means you can overprint a line, which may be useful for special effects.

Character Width

You can switch your printout from normal- to double-width characters by putting the "%WIDE" command in your text. Use the "%NARROW" command to resume printing with normal characters.

Page Layout

RUNOFF measures your printout vertically as well as horizontally, so it knows when it reaches the end of a page. It then activates a sort of "text subroutine" called the trailer. Actually, trailer-header might be a better name, since it consists of the bottom of one page and the top of the next.

You must tell RUNOFF how large the pages should be with the "%SIZE" command followed by a number. As for "%VS", the number is in seventy-seconds of an inch. This number represents the size of the body of the page; i.e., it does not count the header and trailer. RUNOFF normally uses a size of 720 (10 inches). With 11-inch paper, that leaves half an inch for the header, and another half-inch for the trailer.

To define your trailer, use the commands "%TRAILER" and "%ENDT". All text between the two commands will be recorded by RUNOFF, and played back at the end of each page.

You use two commands in your trailer to control the end-of-page routine. One is "%FEED", which tells RUNOFF where one page ends and the next begins. When RUNOFF sees "%FEED", it sends a form feed character to the printer. The form feed causes the printer to move to the top of the next page.

The other command for end-of-page handling is "%PN". When RUNOFF sees "%PN", it places the current page number at that point in your text. If you put "%PN" before "%FEED", the page number will appear at the bottom of each page. If you put "%PN" after "%FEED", the number will be at the top of each page. Of course, if you don't want to number your pages, you needn't use "%PN" at all.

In addition to these two commands, your trailer may contain such things as the title of the document, a copyright notice or even the words "Continued on next page." If you don't use "%TRAILER" and "%ENDT", RUNOFF provides a standard trailer, as shown in line 30050 of the program. This trailer causes RUNOFF to:

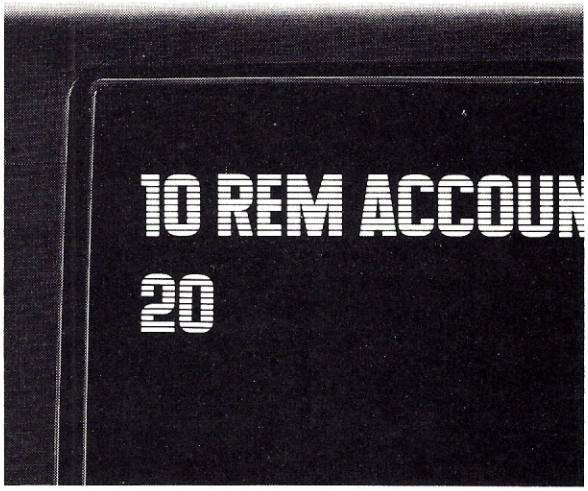
1. Select standard vertical spacing (1/6 inch).
2. Skip one blank line.
3. Switch to double-width characters.
4. Turn on line centering.
5. Print a "__", the current page number, and another "__". Because centering is on, this text will be centered between the left and right margins.
6. Move the printer to the top of the next page.

Program listing. The RUNOFF word processing program for the Atari and the Epson MX-70 or MX-80 printer.

```
100 DATA % % % % % %
110 DATA %LM 41 %RM 70
120 DATA 8 Norton Ct. % Easthampton_ MA ^^^ 01027 % % 16-Apr-81 % % % %
130 DATA %LM 11 %INDENT 4 Dear reader_ %US 24 %
140 DATA %INDENT 4 This letter will introduce you to %WIDE RUNOFF_ %NARROW
150 DATA a word processing program for the Atari personal computer and the
160 DATA Epson MX80 or MX70 printer. Its features include: % % %US 12
170 DATA %LM 21 %RM 60 %INDENT -3 1. Fitting lines of text to your specified
180 DATA left and right margins. % %
190 DATA %INDENT -3 2. Variable vertical spacing. % %
200 DATA %INDENT -3 3. Changing from normal to %WIDE extra wide %NARROW
210 DATA characters on command. % %
220 DATA %INDENT -3 4. Automatic end-of-page processing_ with options such
230 DATA as numbering the pages_ or putting a title at the top of each. % % % %
240 DATA %LM 11 %RM 70 %US 24 %INDENT 4 All in all_ this program should make it
250 DATA easy for you to prepare high-quality letters_ reports_ and documents
260 DATA of all types.  I hope you enjoy it. % % %LM 41 Sincerely_
270 DATA % % Kent Multer
20000 MAIN=30000:GOTO MAIN
20001 REM
20002 REM
20003 REM
20004 REM  RUNOFF  Word Processor
20005 REM
20006 REM  by Kent A. Multer
20007 REM  Copyright (C) 1981
20008 REM  All rights reserved
20009 REM
20010 REM
22900 REM ============================
22994 REM
22995 REM  FITWRD
22999 REM
23000 IF CLM+OBW+W+WIDE>RMARGIN THEN GOSUB PRLINE
23015 IF WFLAG THEN WFLAG=0:OBL=OBL+1:OBUF$(OBL)=CHR$(CCWID)
23020 IF OBW>0 THEN OBL=OBL+1:OBUF$(OBL)=" ":OBW=OBW+1+WIDE
23030 OBUF$(OBL+1)=WORD$:OBL=OBL+L:OBW=OBW+W
23040 WORD$="":L=0:W=0:RETURN
23990 REM ============================
23992 REM
23995 REM  FINISH
23999 REM
24000 POP :POP :TRAP ERRHAND
24005 IF L>0 THEN 31210
24010 IF OBL>0 THEN GOSUB PRLINE
24015 CLOSE #2
24020 PRINT #1;CHR$(CCNAR);CHR$(CCESC);"A";CHR$(12);
24025 REM ****** MX-80 only ----->   PRINT #1; CHR$(CCESC);"2";
24030 CLOSE #1
24040 END
24990 REM ============================
24992 REM
24996 REM ERRor HANDler
24999 REM
25000 ERR=PEEK(195):IF ERR=136 OR ERR=6 THEN GOTO FINISH
25010 PRINT CHR$(CCBUZ);PRINT " Error ";ERR:END
25990 REM ============================
25992 REM
25998 REM  RDWORD
25999 REM
26000 L=0:GOSUB RDCHR:IF C$=" " THEN 26000
26010 IF C$=CHR$(CCRET) THEN 26000
26015 IF C$="^" THEN IF  NOT TMODE THEN C$=" "
26020 WORD$=C$:L=1:W=WIDE+1
26030 GOSUB RDCHR:IF C$=" " OR C$=CHR$(CCRET) THEN RETURN
26035 IF C$="^" THEN IF  NOT TMODE THEN C$=" "
26040 W=W+WIDE+1
26050 L=L+1:WORD$(L)=C$:GOTO 26030
26900 RETURN
26990 REM ============================
26997 REM
26998 REM  PRLINE
26999 REM
27000 IF PGLEN+VS>PGSIZE THEN IF RDCHR<>27800 THEN 27100
27005 IF CLM>1 THEN FOR I=1 TO CLM-1:PRINT #1;" ";:NEXT I
27007 IF CENTER THEN J=((RMARGIN-CLM)-OBW)/2:IF J>0 THEN FOR I=1 TO J:PRINT #1;"
 ";:NEXT I
27010 PRINT #1:OBUF$
27020 OBUF$="":OBL=0:OBW=0:CLM=LMARGIN
27027 IF WIDE THEN OBL=OBL+1:OBUF$(OBL)=CHR$(CCWID)
27030 PGLEN=PGLEN+VS
27040 RETURN
27090 REM ============================
27092 REM
27095 REM    End-of-page handler
27099 REM
27100 R=RDCHR:RDCHR=27800:NXTTRL=1
27110 HOLD$=WORD$:HOLDW=W:HOLDL=L
27115 WORD$="":W=0:L=0
27120 HOLDVS=VS:HOLDWIDE=WIDE:HOLDWF=WFLAG
27125 WIDE=0:WFLAG=0
27130 HOLDBUF$=OBUF$:HOLDOBL=OBL:HOLDOBW=OBW
27140 OBUF$="":OBL=0:OBW=0
```

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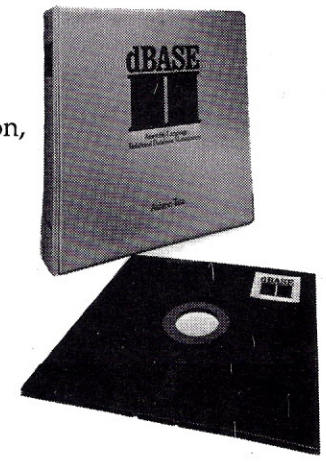
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7. Skip three more blank lines.

Normally you'll define your trailer at the beginning of the document. You can redefine it at any time.

At times you'll want to advance to a new page before the current one is full, perhaps at the end of a chapter. To do this, put the command word "%PAGE" at the desired point in your text .

When RUNOFF begins processing the trailer, it saves the current status of the margins, vertical spacing, centering mode and character width. Your trailer can change any of these features, and the correct status will be restored automatically when RUNOFF begins printing the body of the next page.

Using the Program

When you run the program, it will ask you for the name of an input file. Type the name of the disk or cassette file that you have presumably prepared with a text editor.

RUNOFF will then ask if the file has line numbers. This is for you folks with the Atari Assembler/Editor cartridge, which puts line numbers in all source files. If you type "Y", RUNOFF will throw away all characters from the beginning of each line to the first blank space.

If you don't have a text editor, you can still use RUNOFF by typing in your text as a series of DATA statements. An example of this is shown in the listing. To process DATA statements instead of a file, just type a carriage return when RUNOFF asks for an input file.

RUNOFF also asks you for an output file name. If you just type a return, the program assumes you want your text to go to the printer, file "P:". This will usually be correct, unless you plan to make many copies of something. In that case you can direct the output to disk or cassette, and use the DOS COPY command to make your printouts. Using DOS will be faster than repeated runs of the program.

Using RUNOFF Without a Text Editor

I put this option in the program because I got tired of having to reboot my computer every time I changed from the text editor to the BASIC cartridge. It's a handy way to do fairly short documents; for longer ones, the renumbering and searching functions of an editor will be worth having.

Note that the program begins at the line number 20000. This leaves all line numbers from 0 to 19999 for your DATA statements.

After typing in some DATA statements, you can save them for later use with BASIC's LIST command. For instance, typing LIST "C:", 10,1000 will cause BASIC to make a cassette copy of all data from line 10 to line 1000. You may bring the copy back into memory with the ENTER command.

One problem with using DATA statements is that you can't put any commas in the text, because BASIC's READ statement filters them out. If you look at the example in the program listing, you will note that it has an "_" (underline) character wherever a comma should be. RUNOFF converts the underlines to commas.

RUNOFF has two special commands that are for use only with DATA statements, not in files. One is "%GOTO", which must be followed by a number. As you might expect, it causes RUNOFF to begin reading text from the specified line number. This command allows you to rearrange your text after you've typed it in, which helps make up for the lack of a renumbering command in BASIC.

If you use a "%GOTO" from a high-numbered line to a lower-numbered one, you may need to use the "%END" command. It simply acts as an end-of-file indicator, and prevents your "%GOTO"s from putting RUNOFF into an infinite loop.

Installation Notes

The program shown in the listing is set up for the MX-70 printer. MX-80 users should add the extra statements indicated by the remarks at lines 24025, 31125, 31327 and 31425.

You may wish to redefine the special characters "^", "%", and "_". In fact, I've used those characters only so that they'll be readable on the listing. At home, I use some of the Atari's graphics characters: there are enough circles, lines and other interesting shapes that you should be able to find something you like.

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2716 Char. Gen. A 7	$19.95
2716 Program A 12	$19.95

A-D CONVERTER



JBEs 16 channel A-D Converter plugs into your Apple II computer. It uses an ADC0817 which incorporates a 16 channel multiplexer and an 8 bit A-D Converter. The 16 inputs are high impedance and the voltage range is 0 to 5.12 volts. Conversion time is <100 μsec. The resolution is 8 bits or 256 steps, linearity is ± 1/2 step. Two 16 pin DIP sockets are used for input, GND & reference voltage connections. There are 3 single bit TTL inputs. Doc. includes sample program.

81-132A Assm.	$89.95
81-132K Kit	$69.95
81-132B Bare Board	$29.95

EPROM PROGRAMMER



JBE's EPROM Programmer is designed to program 5V 2516's, 2532's & 2716's. It interfaces to the JBE Parallel I/O card using four ribbon cables. An LED indicates when the EPROM is being programmed. A textool zero insertion force socket is used for the EPROM. Comes with complete documentation for writing and reading EPROM's in the Apple II or Apple II Plus. Cables available separately.

80-244A Assm.	$49.95
80-244K Kit	$39.95
80-244B Bare Board	$24.95

PARTS

6502 MPU	$9.95
6522 VIA	$9.95
Z-80 MPU	$9.95
Z-80 PIO	$9.95
TWO 2114 RAM	$9.95
2716	$14.95
50 pin conn.	$5.95
Dip Jumper 2 ft.	$4.95

6522 APPLE II INTERFACE



The JBE 6522 Parallel Interface for the Apple II Computer, plugs directly into any slot 1 through 7 in the Apple. This card has 2 6522 VIA's that provide:

- Four 8 bit bi-directional I/O ports
- Four 16 bit programmable timer/counters
- Serial shift registers
- Handshaking

A 74LS05 is for timing. Four 16 pin sockets provide easy connections to other peripheral devices. (Dip jumpers with ribbon cables are also available from JBE) The 6522 Parallel I/O card interfaces to the JBE EPROM programmer. Understanding of machine language required to use this board. Inputs and outputs are TTL compatible.

79-295A	$69.95 Assembled
79-295K	$59.95 Kit
79-295B	$19.95 Bareboard

SPEECH SYNTHESIZERS



JBEs Speech Synthesizers use the Votrax SC-01 Phoneme Synthesizer chip. The SC-01 phonetically synthesizes continuous speech of unlimited vocabulary. The SC-01 contains 64 different phonemes and 4 levels of inflection accessed by an 8 bit code. It requires 10 Bytes per second for continuous speech. Both boards have an audio amp for direct connection to an 8 ohm speaker.

Documentation includes basic user programs, a phoneme chart and listing of coded words to help you get started. Documentation for the Apple II® Speech Synthesizer includes a disk with many user programs.

81-088 Apple II Speech Synthesizer	$139.95
81-120 Parallel Input Speech Synthesizer	$149.95

Prices include the SC-01 Chip
SC-01 sold separately for $ 75.95

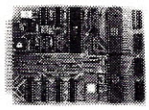
EPROM EXPANSION CARD



JBE EPROM Expander for the Apple II holds six 5V 2716s for a total of 12K bytes of EPROM. This board takes the place of the on board ROM in the Apple. It is software switchable by the same technique used by the Apple II firmware card. Solder jumpers are for reset to the Apple ROM or EPROM Expansion Card. Use JBE EPROM Programmer and Parallel I/O to program your EPROMs. EPROMs sold separately.

81-085A Assm.	$59.95
81-085K Kit	$49.95
81-085B Bare Board	$39.95

81-260 "SLIM"



Single board large scale Integration Microcomputer. This 4.5 x 6.5 board uses the 6502 Microprocessor, two 6522 VIA's, four 2114 RAM's, 2516, 2716 or 2532 EPROM. The fully buffered 22/44 pin bus is similar to the KIM® , SYM® , and AIM® expansion connector. The four 8 bit I/O ports connect through 16 pin dip sockets. This board was designed for control and is ideal for Personal and OEM use.

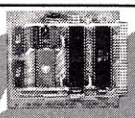
- 6502 MPU
- Two 6522 VIA's
- Four 2114 RAM's (2K bytes)
- One EPROM 2516 or 2532
- Crystal clock 1 Mhz
- Requires 5V 1AMP Power
- 4.5 x 6.5 card
- Power on reset
- Fully buffered-expandable
- Solder mask-both sides

Use your Apple II Computer, JBE 6522 Parallel Interface card and EPROM Programmer as a development system for SLIM.

Prices:

81-260A	$199.95 Assembled
81-260K	$149.95 Kit
81-260B	$ 39.95 Bare Board

6502 MICROCOMPUTER

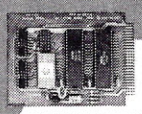


6502 MPU, 6522 VIA, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 400 Ma. Two independent 8 bit I/O ports with handshake lines. RC controlled 1 Mhz clock.

Complete documentation. I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

80-153 Assm.	$110.95
80-153 Kit	$ 89.95
80-153 Bare Board	$ 19.95

Z-80 MICROCOMUTER

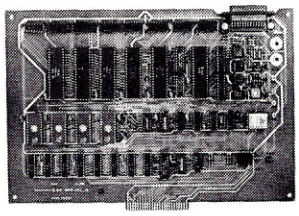


Z-80 MPU, Z-80 PIO, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 300 Ma. Two independent 8 bit I/O ports with handshake lines. RC controlled 2Mhz clock.

Complete documentation. I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

80-280 Assm.	$129.95
80-280 Kit	$119.95
80-280 Bare Board	$ 19.95

JBE I MICROCOMPUTER



JBE's 7.75 x 11.75 6502 base Microcomputer has the capacity for 16K of EPROM, 4K of RAM, 8 Parallel Ports and 1 Serial Port. Monitor and Tiny Basic are also available. The fully populated version includes:

- 1 6502 CPU
- 4 6522 VIA (8 Parallel I/O Ports)
- 1 AY5-1013 (Serial I/O Ports)
- 8 2114 RAM (4K)
- 2 2716 EPROM (Monitor & Tiny Basic)

The partially populated version includes:

- 1 6502 CPU
- 1 6522 VIA (2 Parallel I/O Ports)
- 1 AY5-1013 (Serial I/O Port)
- 2 2114 RAM (1K)
- 1 2716 EPROM (with Monitor)

Both versions include sockets for 2716s or 2532s, 8 16 pin sockets for I/O interfacing and a DB25 connector for RS232.

All address and data lines are brought off the board to the 50 pin edge connector. (similar to the Apple II bus)

This board also features power on reset and cassette interface.

81-030 C Fully Populated	$349.95
81-030M Partially Populated	$249.95
81-030B Bare Board	$ 89.95
2716 EPROM (with Monitor)	$ 19.95
2715 EPROM (with Tiny Basic	$ 19.95

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Listing continued.

```
27150 HOLDLM=LMARGIN:HOLDRM=RMARGIN:HOLDCLM=CLM
27160 CLM=LMARGIN
27170 HOLDCTR=CENTER:CENTER=0
27190 RETURN
27790 REM ==========================
27792 REM
27795 REM    RDCHR (from trailer)
27799 REM
27800 C$=TRAILER$(NXTTRL,NXTTRL):NXTTRL=NXTTRL+1
27900 RETURN
27990 REM ==========================,
27992 REM
27995 REM  RDCHR (from file)
27999 REM
28000 GET #INFILE,C:C$=CHR$(C)
28002 L$=STR$(L):L=VAL(L$)
28005 IF START THEN 28015
28010 IF C<>CCRET THEN RETURN
28015 START=0:IF  NOT SLN THEN RETURN
28020 GET #INFILE,C:C$=CHR$(C):IF C$<>" " THEN 28020
28900 RETURN
28990 REM ==========================
28997 REM
28998 REM  RDCHR (from DATA)
28999 REM
29000 IF NXTDAT=DATLEN THEN READ D$:DATLEN=LEN(D$)+1:D$(DATLEN)=" ":NXTDAT=0
29010 NXTDAT=NXTDAT+1:C$=D$(NXTDAT,NXTDAT)
29050 IF C$="_" THEN C$=","
29100 RETURN
29997 REM
29998 REM ============ MAIN PROGRAM ==================================
30000 REM
30010 DIM IN$(16),OUT$(16)
30020 DIM OBUF$(100):OBL=0:OBW=0:DIM HOLDBUF$(100)
30030 DIM C$(1)
30040 DIM WORD$(32),HOLD$(32),D$(128)
30050 DIM TRAILER$(200):TRAILER$="%VS 12 % %WIDE %CENTER - %PN - % %FEED % % %EN
DT "
30060 DIM L$(16)
30500 NXTDAT=0:DATLEN=0:INFILE=2:WIDE=0:PGSIZE=720:PGLEN=0:VS=12:PGNUM=1
30510 SLN=0:START=1:LMARGIN=1:RMARGIN=80:TMODE=0:WFLAG=0:CENTER=0
30800 CCESC=27:CCNAR=20:CCWID=14:CCBUZ=253:CCFF=12:CCRET=155:CCRVS=160
30900 PRLINE=27000
30910 RDWORD=26000
30920 ERRHAND=25000
30930 FINISH=24000
30940 FITWRD=23000
30950 LOOP=31200
30990 EOP=32767
31000 PRINT "Input file";:INPUT IN$
31010 IF IN$="" THEN RDCHR=29000:GOTO 31040
31020 RDCHR=28000:PRINT "Strip line numbers (type Y or N)";:INPUT C$:IF C$="Y" T
HEN SLN=1
31030 OPEN #2,4,0,IN$
31040 TRAP ERRHAND
31100 PRINT "Output file";:INPUT OUT$:IF OUT$="" THEN OUT$="P"
31110 OPEN #1,8,0,OUT$
31120 PRINT #1;CHR$(CCNAR);CHR$(CCESC);"A";CHR$(VS);
31125 REM ****** MX-80 only ----->   PRINT #1; CHR$(CCESC);"2";
31190 REM ==========================
31192 REM
31195 REM  Main I/O loop
31197 REM
31198 REM    Input section
31199 REM
31200 GOSUB RDWORD
31210 IF WORD$(1,1)<>"%" THEN 32000
31290 REM ============================
31292 REM
31295 REM    Keyword handling
31299 REM
31300 IF WORD$="%" THEN GOSUB PRLINE:GOTO LOOP
31310 IF WORD$="%LM" THEN GOSUB RDWORD:LMARGIN=VAL(WORD$):CLM=LMARGIN:GOTO LOOP
31315 IF WORD$="%INDENT" THEN GOSUB RDWORD:CLM=CLM+VAL(WORD$):GOTO LOOP
31320 IF WORD$="%RM" THEN GOSUB RDWORD:RMARGIN=VAL(WORD$):GOTO LOOP
31325 IF WORD$<>"%VS" THEN 31330
31326 GOSUB RDWORD:VS=VAL(WORD$):PRINT #1;CHR$(CCESC);"A";CHR$(VS);
31327 REM ****** MX-80 only ----->   PRINT #1; CHR$(CCESC);"2";
31328 GOTO LOOP
31330 IF WORD$="%CENTER" THEN CENTER=1:GOTO LOOP
31335 IF WORD$="%ENDC" THEN CENTER=0:GOTO LOOP
31340 IF WORD$="%GOTO" THEN GOSUB RDWORD:RESTORE VAL(WORD$):GOTO LOOP
31350 IF WORD$="%SIZE" THEN GOSUB RDWORD:PGSIZE=VAL(WORD$):GOTO LOOP
31360 IF WORD$="%WIDE" THEN WIDE=1:WFLAG=1:GOTO LOOP
31370 IF WORD$="%NARROW" THEN WIDE=0:OBL=OBL+1:OBUF$(OBL,OBL)=CHR$(CCNAR):GOTO L
OOP
31380 IF WORD$="%FEED" THEN PRINT #1;CHR$(CCFF);:PGNUM=PGNUM+1:PGLEN=0:GOTO LOOP
31390 IF WORD$="%PN" THEN WORD$=STR$(PGNUM):L=LEN(WORD$):W=L*(WIDE+1):GOTO 32000
31400 IF WORD$<>"%ENDT" THEN 31500
31405 WIDE=HOLDWIDE
31410 GOSUB PRLINE:PGLEN=0:RDCHR=R:WORD$=HOLD$:W=HOLDW:L=HOLDL
31420 VS=HOLDVS:PRINT #1;CHR$(CCESC);"A";CHR$(VS);
31425 REM ****** MX-80 only ----->   PRINT #1; CHR$(CCESC);"2";
31430 OBUF$=HOLDBUF$:OBL=HOLDOBL:OBW=HOLDOBW
31440 LMARGIN=HOLDLM:RMARGIN=HOLDRM:WFLAG=HOLDWF:CLM=HOLDCLM
31450 CENTER=HOLDCTR
31490 GOTO 31210
31500 IF WORD$<>"%TRAILER" THEN 31600
31510 TRAILER$="":TMODE=1
31520 GOSUB RDWORD:WORD$(L+1)=" ":TRAILER$(LEN(TRAILER$)+1)=WORD$
31530 IF WORD$="%ENDT " THEN TMODE=0:GOTO LOOP
31540 GOTO 31520
31600 IF WORD$="%PAGE" THEN WORD$="":W=0:L=0:PGLEN=PGSIZE:GOSUB PRLINE:GOTO LOOP
31610 IF WORD$="%END" THEN RESTORE EOP:WORD$="":W=0:L=0:GOTO LOOP
31990 REM ============================
31992 REM
31995 REM    Output section
31999 REM
32000 GOSUB FITWRD
32100 GOTO LOOP
```

This program is available on cassette or disk for $10 from Magic Metal Productions, PO Box 732, West Acton, MA 01720.

Program Design

Most BASIC programs published in computer magazines are written with efficiency in mind. That is, they are "efficient" for the computer. Typically the variable names will be very short, and as many statements as possible will be packed into each line. These practices make a program run faster and use less memory, but they also make it much harder to understand, debug and modify. This is especially true if you put it away for a few months and then come back to it, or if the program was written by someone other than yourself.

With the emergence of disciplines such as structured programming and software engineering, professional programmers have come to realize that, in the long run, it's more "efficient" to use up those extra bytes and microseconds, to make things easier on the human being who must work with the program. Some of the "human engineering" techniques that I have used in RUNOFF are:

- The use of names for all subroutines and some other important points in the program. Atari BASIC lets you do this, although the names must be explicitly initialized (in lines 30900 to 30990). The "name" of the RDCHR subroutine is actually changed to one of three different values, depending on whether RUNOFF is reading characters from a file, DATA statements or the trailer.

- The use of lots of remarks, not just to explain the program, but to make the listing more readable. There are some REM statements in RUNOFF that don't have any text in them at all—they're literally just there to take up space. Having that extra space makes it easier to find the part of the program that you want to study.

- Starting each subroutine at a line number that is a multiple of 1000. That gives you plenty of room to add more statements.

Conclusion

I hope these techniques will make it easy for you to understand the program, and to extend it to suit your needs. For the sake of simplicity, I've only included those features which are available on both printers. I've left out the extra character sets of the MX-80, and the high-resolution graphics of the MX-70. You should be able to add some of these features yourself.■

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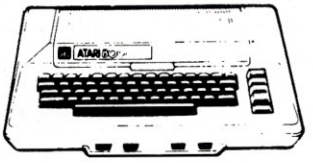
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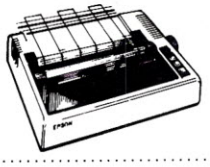
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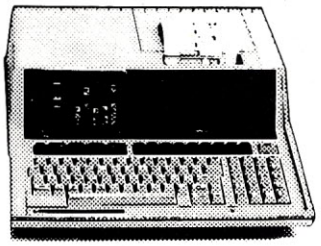
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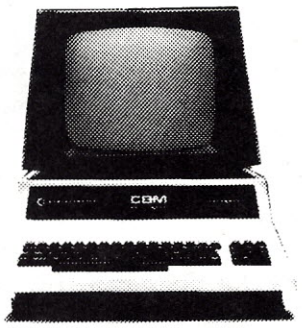
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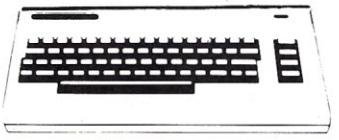
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Will micros in the schools tame wild old Wyoming?

Cowboys and Computers

By John C. Russell

The East Coast has its New England computing establishment, the West Coast has its Silicon Valley, and in between plenty of other technological types are doing their thing to further the computer's effect on our daily lives.

But then, there are some places that couldn't possibly have any stake in the computer revolution. Like wild old Wyoming, for example. Everybody knows that cowboys and computers have nothing in common.

Bad assumption! While it is true you won't find major computer manufacturing plants sharing the horizon with oil rigs, and the antelope will no doubt continue to outnumber programmers for some time, there is a growing movement in Wyoming to incorporate computer literacy programs in the public schools.

The focal point of these efforts is the Science and Mathematics Teaching Center (SMTC) of the University of Wyoming in Laramie. Affiliated with both the College of Education and the College of Arts and Sciences, SMTC is a flexible arm that reaches effectively to the far-flung districts of the state, providing guidance and support to science and mathematics teachers. Recently, it has jumped enthusiastically into the microcomputer education arena, and from here on out it promises that Wyoming will grow with the new technology.

The main man in SMTC's computer goings-on is Dr. Bob Kansky, a dynamic individual who is also well-known through his work with the National Council of Teachers of Mathematics. One of Kansky's most recent projects was to coauthor *Guidelines for Evaluating Computerized Instructional Materials*, a document that takes one step toward committing the National Council to computers in the classroom.

Around the state some pockets of computer interest have existed for a number of years. In Rock Springs, teacher Bob Hilgenfeld has been a leading computer advocate, conducting University-approved courses in computing for teachers in Wyoming and Utah. Further, his junior high classes produce research projects with the aid of The Source electronic informational utility, an activity that may be unique in the nation.

While the antelope will continue to outnumber programmers for some time, there is a growing movement in Wyoming to incorporate computer literacy programs in the public schools.

Dave Hamaker, a high school math/science teacher, and Don Larsen, a teacher of special education, both of Lusk, like to talk of adapting the Apple for small-school administrative tasks. Their students actually do the school's class registration, and assist local businesses in creating mailing lists and writing stockholder reports.

Walt Miner, a Cheyenne English teacher, is a reminder that computers are not the private playthings of scientists. He is working with a Title IV-C grant to develop highly specific programs to correct highly specific student writing errors, and is using a word processor to help students with creative composition.

Plans are in the works for a statewide, student-run microcomputer network which not only will encourage the exchange of ideas among schools, but eventually may serve some needs of administrators and the State Department of Education.

Last summer, a great number of teachers from across Wyoming, Colorado, Nebraska and Montana descended on the University campus to take advantage of a variety of computer-related courses. Besides the usual Basic programming course, there was a software evaluation seminar which reviewed a large amount of commercial material lent by many vendors, a course in the variety of applications of computers in the school and a two-week course in computer literacy for teachers.

A National Science Foundation grant brought together 40 teachers from 20 Wyoming districts to learn the intricacies of the Apple II. SMTC will then deliver Apple systems and support personnel to the participating districts for several weeks at a time during this academic year. The point of this project is to sow the seeds of interest in teachers with little experience in computing.

An important concern for the staff of SMTC, as it is with many others nationwide, is the misrepresentation of the potential for computers in education. Drill-and-practice programs are some of the easiest to write, and

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so many of the earliest efforts by the commercial houses have been along those lines. Smiling or scowling faces have decorated computer screens from the Atlantic to the Pacific, accompanied by the tedious "Super!" or "Try again." Skeptics can point to the computer and accuse it of being nothing more than a set of electronic flash cards.

There is great need for sophisticated, valid simulations, for demonstrations with interactive capabilities, for meaningful problem-solving vehicles and for a number of packages dealing with other applications.

While knowledgeable teachers are beginning to make these desires clear, there lives at the same time the issue of software copyright and software piracy. The school establishment must bear a responsibility for helping to protect the product, and hence the livelihood, of the talented designers and programmers.

The school establishment must bear a responsibility for helping to protect the product, and hence the livelihood, of the talented designers and programmers.

SMTC has addressed this point of controversy publicly and knows of no other similar institution to have done so. It has authorized and published the following declaration:

"The Science and Mathematics Teaching Center of the University of Wyoming will not participate in the unauthorized reproduction or exchange of any computerized courseware which bears an explicit or implicit copyright."

In further discussion, such unauthorized activity is deemed to be "larceny."

SMTC looks forward to the day when other responsible voices will echo this stand, and in the meantime savors the excitement that computers have brought to the schools of the mountains and high plains.■

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Here's a combo—the Exidy Sorcerer and the IDS 440 Paper Tiger—that'll give you printed graphics.

Taming the Tiger

By Roger A. Kemp

To me, the most enjoyable part of programming is creating displays that do more than present the data. Unless the display stands out and grabs the viewer, I feel that I haven't done a good job. But even if you create a masterpiece, how do you get a hard copy? The answer is a printer with graphics capability.

I chose the Integral Data Systems IDS-440 Paper Tiger for my Exidy Sorcerer. This model has two modes of operation: normal and graphics. The normal mode doesn't require much understanding to operate. All you have to do is connect it to the Sorcerer's parallel output, set the Sorcerer's output to the Centronics driver (in Monitor, SE O=L) and everything sent to the screen will go to the Tiger.

That is, everything below ASCII 128. This is where the graphics option comes in.

Sorcerer's Display

The Sorcerer's screen is made up of 30 lines by 64 characters. Each of these 1920 characters is uniquely identified with an address from F080 through F7FF hex. These memory locations contain the character code for the character displayed at that particular screen space (Fig. 1).

The bit pattern for the character code is stored in the eight consecutive locations starting at:

(character code * 8) + F800 H

Since codes 0 through 31 and 127 are control codes, only the data with codes 32–126 and 128–255 are displayed. Codes 32–126 are standard ASCII, codes 128–191 are Sorcerer-defined graphics and 192–255 are user-defined characters.

When the Tiger is in the graphics mode, it doesn't interpret the data sent to it as standard ASCII. This means that the Tiger no longer uses its look-up table to determine the pattern to be printed. Instead, the data is interpreted as a binary-coded value to be output directly to the seven vertical print wires (bit 0 on top). Since Exidy lines are eight vertical bits, you can't output a complete Exidy line with one pass of the Tiger printhead.

To complicate matters more, when the printhead is returned for the next pass (CONTINUOUS SCANNING), bit 0 will overlap bit 6 from the pass just finished. This means that either bit 0 or bit 6 must always be zero so that the previous data won't be corrupted.

The IDS manual is misleading in this area. You're told in section 6 that bit 6 must be kept zero. But if you allow bit 0 to be a one, you take the chance of a data byte being 03H. A 03H is interpreted by the Tiger as the first byte of a two-byte command

Address correspondence to Roger A. Kemp, 1833 Reynosa Drive, Torrance, CA 90501.

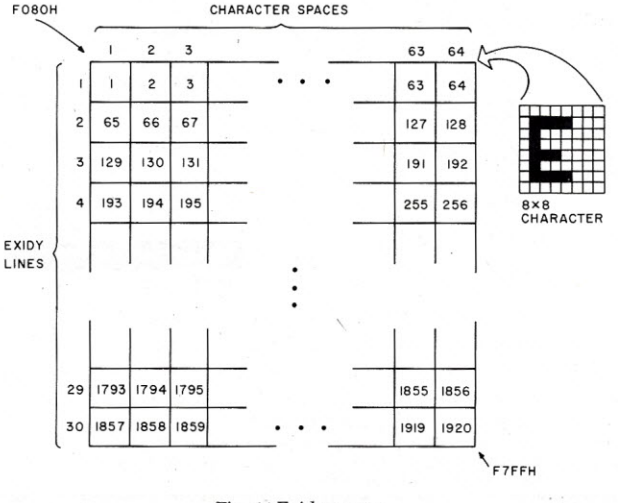


Fig. 1. Exidy screen.

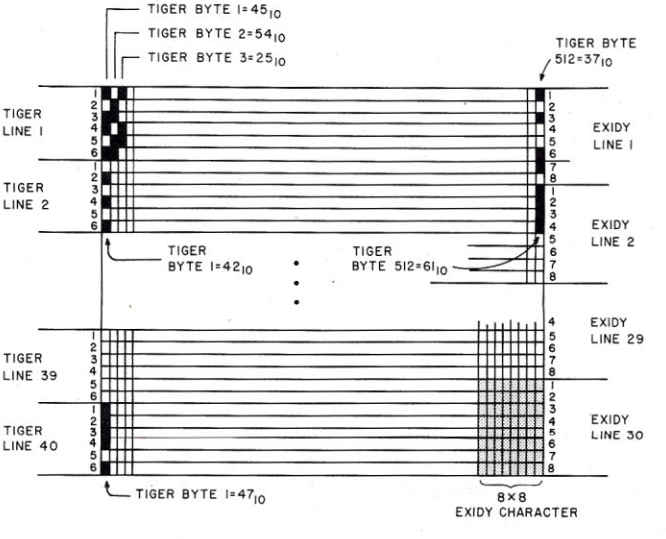


Fig. 2. Tiger vs Exidy screen partition.

(ETX). You can imagine the problems you'll encounter if the byte is really data and not part of a command. Making bit 0 always equal to zero eliminates both concerns.

To transfer the bit pattern displayed on the screen to the Tiger, you have to partition the screen into 40 lines of 512 vertical six-bit bytes each. Since the screen is really made up of 30 lines with 512 vertical eight-bit bytes, the total number of vertical bits in each of the 512 columns is the same (Fig. 2).

Looking a little closer, you see that four passes of the Tiger's printhead will copy three complete Exidy lines from the screen (4*6=3*8). I'm sure that IDS didn't have this in mind when they made the buffer size 2048 with the graphics option, but it works out nicely (four passes * 512 bytes).

A simplistic approach to the operation would be to start with the left-most vertical six bits, and, moving to the right, send the binary-coded value to the Tiger. After you've transferred 512 bytes, go to the next group directly below the one just transferred, and do it again. Repeat the process until the entire pattern on the screen has been transferred to the Tiger, with the end result being hard copy of your display.

As stated above, this is a simplistic approach. The problem is that the pattern on the screen isn't stored in that fashion anywhere except on the screen. So how do we get those vertical bits to transfer?

The key is to make the operation as simple as possible and repeat it until the task is done. In this case, we work with three Exidy lines for every four passes of the Tiger's printhead, and do it ten times. But before I go into the program, a little explanation on the hardware limitations is in order.

Hardware Limitations

If you have already looked ahead at the program, you found that the buffer size is 1984 bytes, and not 2048. The reduction was made because of a limitation in the Tiger.

The largest characters-per-inch function allowed in the graphics mode is 12 cpi, with a horizontal dot spacing of 64.2 dots per inch. Theoretically, you can copy an entire line (512 dots in length) in eight inches. However, there is a maximum scan that you can achieve on the Tiger, and this limits you to 62 full characters before the Tiger does an auto-

Program listing. Tiger graphics from the Exidy screen in Micropolis 8080/85 assembly language.

```
0000                            ORG     3000H
3000            CHAR            DS      2
3002            EBYTE           DS      1
3003            *
3003            *          THESE MUST BE IN ORDER
3003            *
3003            EBIT            DS      1
3004            TBIT            DS      1
3005            ESYM            DS      1
3006            ELINE           DS      1
3007            EROW            DS      1
3008            TBYTE           DS      2
300A            TBUFF           DS      1984
37CA            *
37CA    F080    SCREEN          EQU     0F080H          ;BASE ADDRESS OF SCR
EEN
37CA    F800    ASCII           EQU     0F800H          ;BASE ADDRESS OF ASC
II TABLE
37CA    00FF    PPORT           EQU     0FFH            ;OUTPUT PORT
37CA            *
37CA            *           INITIALIZATION
37CA            *
37CA 21 80 F0   INIT            LXI     H,SCREEN
37CD 22 00 30                   SHLD    CHAR            ;START AT BASE ADDRE
SS
37D0 3E 1E                      MVI     A,1EH           ;DENSITY
37D2 CD 1E 39                   CALL    PUTOUT          ;OUTPUT
37D5 3E 03                      MVI     A,03H           ;GRAPHICS MODE
37D7 CD 1E 39                   CALL    PUTOUT
37DA 21 03 30                   LXI     H,EBIT
37DD 36 08                      MVI     M,8             ;EBIT=8
37DF 23                         INX     H
37E0 36 06                      MVI     M,6             ;TBIT=6
37E2 23                         INX     H
37E3 36 3E                      MVI     M,62            ;ESYM=62
37E5 23                         INX     H
37E6 36 0A                      MVI     M,10            ;ELINE=10
37E8 06 07                      MVI     B,7             ;# OF TIMES LOOP DON
E
37EA 3E 01                      MVI     A,1             ;FLAG FOR BELOW
37EC 0E FF      LOOP            MVI     C,255           ;# OF TIMES LOOP1 DO
NE
37EE 23         LOOP1           INX     H               ;ADRESS OF TBUFF
37EF 36 00                      MVI     M,0
37F1 0D                         DCR     C
37F2 C2 EE 37                   JNZ     LOOP1           ;GO DO ANOTHER
37F5 FE 00                      CPI     0               ;SEE IF LOOP ALL DON
E
37F7 CA 04 38                   JZ      POINT           ;YES START
37FA 05                         DCR     B
37FB C2 EC 37                   JNZ     LOOP            ;DO ANOTHER GROUP
37FE 78                         MOV     A,B             ;RESET FLAG FROM ABO
VE
37FF 0E CA                      MVI     C,202           ;SET UP FOR REST
3801 C3 EE 37                   JMP     LOOP1
3804            *
3804            *       THIS PORTION SETS UP POINTER TO EXIDY CHARACTER
3804            *       BYTE N. MUST COME HERE TO GET NEW EXIDY
3804            *       SYMBOL BYTE.
3804            *
3804 2A 00 30   POINT           LHLD    CHAR            ;HL=SCREEN POSITION
OF SYMBOL
3807 7E                         MOV     A,M             ;A=ASCII VALUE
3808 06 03                      MVI     B,3             ;SET COUNTER FOR RAL
380A 16 00                      MVI     D,0             ;CLEAR D
380C 37         B1              STC
380D 3F                         CMC                     ;CY=0
380E 17                         RAL                     ;X2,X4,X8
380F 5F                         MOV     E,A             ;HOLD IT FOR NOW
3810 7A                         MOV     A,D             ;A=D
3811 17                         RAL                     ;SHIFT HI ORDER X2,X
4,X8 BIT
3812 05                         DCR     B               ;B=B-1
3813 57                         MOV     D,A             ;HOLD IT FOR NOW
3814 CA 1B 38                   JZ      A1              ;X8 COMPLETE, JMP
3817 7B                         MOV     A,E             ;SET UP FOR NEXT SHI
FT
3818 C3 0C 38                   JMP     B1              ;DO X4,X8
381B            *
381B            *       BASE ADDRESS OF EXIDY SYMBOL BYTE IN DE.
381B            *
381B 3A 07 30   A1              LDA     EROW            ;A=ROW # OF SYMBOL B
YTE
381E 6F                         MOV     L,A             ;L=ROW #
381F 26 00                      MVI     H,0             ;HL=ROW #
3821 19                         DAD     D               ;HL=BYTE ADDRESS PLA
CEMENT
3822 EB                         XCHG                    ;DE=HL
3823 21 00 F8                   LXI     H,ASCII         ;HL=ASCII TABLE BASE
3826 19                         DAD     D               ;HL=BYTE ADDRESS WOR
KING WITH
3827 7E                         MOV     A,M
3828 32 02 30                   STA     EBYTE           ;EBYTE=EXIDY BYTE WW
ORKING WITH
382B            *
382B            *       NOW DO TRANSFER TO TIGER BYTES
382B            *
```

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matic carriage return and line feed. A normal carriage return and line feed destroys the continuity you need for your picture. This means a maximum buffer size of 1984 is needed (62*8=496*4). If you were to use ten cpi or 8.3 cpi, you would have to adjust the program to reflect buffer sizes of 1632 and 1568 respectively (51 and 49 characters). These are not the only parameters that need to be changed, but the others are easy to identify.

Program Flow

After setting the density and entering the graphics mode, the flags and counters are initialized, and the buffer (TBUFF) is cleared. Now you are ready to find the Exidy character you are working with ("POINT" routine).

The character code for the current screen space is found at the address pointed to by CHAR. The character code is multiplied by eight, and added to the start address of the ASCII table (F800H):

A=65, 65*8=520, 520=0208H
F800H + 0208H = FA08H

This value is added to the contents of EROW, which points to the proper byte position in the current Exidy character. The byte residing at that address is stored in the work location EBYTE. CHAR is now updated to point to the next screen space.

The next operation involves shifting the eight EBYTE bits into bit 7 of the buffer bytes pointed to by TBUFF, and offset by TBYTE. After each bit is shifted out of EBYTE and into the correct buffer byte, TBYTE is incremented to point to the next buffer byte. This is done until all eight bits in EBYTE have been transferred (EBIT=0). When EBIT reaches zero, a check is made to see if all 62 characters (ESYM) on this Exidy line have

> Although I wrote the program for my Sorcerer, using the Micropolis 8080/85 assembler, the concept applies to any system hooked to the Tiger.

Listing continued.

```
382B 21 0A 30   TRANS           LXI     H,TBUFF         ;HL=TBUFF BASE ADDRE
SS
382E EB                         XCHG                    ;DE=HL
382F 2A 08 30                   LHLD    TBYTE           ;HL=(TBYTE)
3832 19                         DAD     D               ;HL=STORAGE LOCATION
 FOR
3833                *                                   ;TIGER BYTE WORKING
WITH
3833 37                         STC
3834 3F                         CMC                     ;CY=0
3835 3A 02 30                   LDA     EBYTE           ;A=EXIDY WORKING BYT
E
3838 17                         RAL                     ;CY=MS BIT
3839 32 02 30                   STA     EBYTE           ;STORE IT
383C 7E                         MOV     A,M             ;A=WORKING TIGER BYT
E
383D 1F                         RAR                     ;MS BIT A=CY
383E 77                         MOV     M,A             ;STORE IT
383F 2A 08 30                   LHLD    TBYTE           ;GET TBUFF POINTER V
ALUE
3842 23                         INX     H               ;HL=HL+1
3843 22 08 30                   SHLD    TBYTE           ;STORE IN TBYTE
3846                *
3846                *       SET COUNTERS AND CHECK CONDITIONS FOR PROCEEDING
3846                *
3846                *               SEE IF ALL EBYTE BITS DONE
3846                *
3846 21 03 30   CHECK            LXI     H,EBIT          ;HL=ADDRESS OF EBIT
3849 35                         DCR     M               ;EBIT=EBIT-1
384A C2 2B 38                   JNZ     TRANS           ;GO DO NEXT EBIT
384D 36 08                      MVI     M,8             ;EBIT=8
384F 2A 00 30                   LHLD    CHAR            ;HL=SCREEN ADDRESS
3852 23                         INX     H               ;SET NEXT ADDRESS
3853 22 00 30                   SHLD    CHAR            ;STORE AWAY
3856                *
3856                *                YES ALL DONE, SEE IF LAST SYMBOL
3856                *
3856 21 05 30                   LXI     H,ESYM          ;HL=ADDRESS ESYM
3859 35                         DCR     M               ;ESYM=ESYM-1
385A C2 04 38                   JNZ     POINT           ;GO GET NEXT
385D 36 3E                      MVI     M,62            ;ESYM=62
385F                *
385F                *               SEE IF ALL BYTES THIS EXIDY SYMBOL DONE
385F                *
385F 3A 07 30                   LDA     EROW            ;GET EXIDY BYTE ROW
3862 3C                         INR     A
3863 32 07 30                   STA     EROW            ;STORE IT
3866 FE 08                      CPI     8               ;SEE IF LAST DONE
3868 CA 8B 38                   JZ      SETCH           ;YES ALL DONE THIS S
YMBOL
386B                *
386B                *             SET CHAR TO START ADDRESS OF THIS EXIDY LI
NE
386B                *
386B 2A 00 30   CHECK3           LHLD    CHAR            ;HL=SCREEN ADDRESS
386E 1E C2                      MVI     E,0C2H
3870 16 FF                      MVI     D,0FFH          ;DE=-62
3872 19                         DAD     D
3873 22 00 30                   SHLD    CHAR            ;STORE IT
3876                *
3876                *                YES ALL DONE THIS EXIDY SCREEN ROW
3876                *                SEE IF TIGER BYTES THIS GROUP DONE
3876                *
3876 21 04 30   CHECK2           LXI     H,TBIT          ;HL=ADDRESS OF TBIT
3879 35                         DCR     M
387A CA 9B 38                   JZ      CHECK1          ;YES, SEE IF 1984 DO
NE
387D                *
387D                *                  NOT DONE WITH LAST BIT IN TIGER
387D                *                  BYTE FOR OUTPUT, SO RESET OFFSET
387D                *                  POINTER TO BEGINING OF 496 GROUP
387D                *
387D 2A 08 30                   LHLD    TBYTE           ;HL=POINTER VALUE
3880 1E 10                      MVI     E,10H
3882 16 FE                      MVI     D,0FEH          ;DE=-496
3884 19                         DAD     D
3885 22 08 30                   SHLD    TBYTE           ;STORE IN TBYTE
3888 C3 04 38                   JMP     POINT
388B                *
388B                *                ALL BYTES THIS EXIDY SYMBOL DONE
388B                *
388B 2A 00 30   SETCH            LHLD    CHAR            ;HL=SCREEN ADDRESS
388E 23                         INX     H
388F 23                         INX     H
3890 22 00 30                   SHLD    CHAR            ;SET TO NEXT EXIDY L
INE
3893 3E 00                      MVI     A,0
3895 32 07 30                   STA     EROW            ;EROW=0
3898 C3 76 38                   JMP     CHECK2
389B 36 06      CHECK1          MVI     M,6             ;TBIT=6
389D 21 08 30                   LXI     H,TBYTE         ;HL=ADDRESS OF TBYTE
38A0 7E                         MOV     A,M             ;A=(TBYTE)
38A1 FE C0                      CPI     0C0H
38A3 C2 04 38                   JNZ     POINT           ;NOT=1984
38A6 23                         INX     H               ;HL=TBYTE+1 ADDRESS
38A7 7E                         MOV     A,M             ;A=(TBYTE+1)
38A8 FE 07                      CPI     07H             ;SEE IF=1984
```

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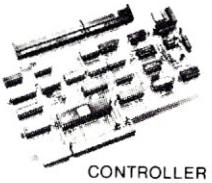
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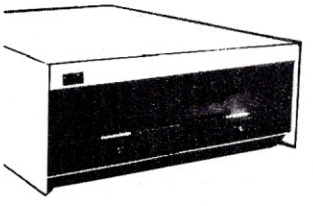
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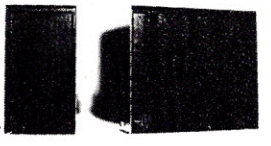
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```
38AA C2 04 38                   JNZ     POINT           ;NOT DONE, CONTINUE
38AD                    *
38AD                    *         BUFFER FULL, SET BIT 0 & 7=0
38AD                    *
38AD 21 08 30   ROUT    LXI     H,TBYTE         ;HL=ADDRESS OF TBYTE
38B0 36 00              MVI     M,0             ;TBYTE=0
38B2 23                 INX     H
38B3 36 00              MVI     M,0             ;TBYTE=0
38B5 0E C0              MVI     C,0C0H
38B7 06 07              MVI     B,07H           ;BC=1984
38B9 21 0A 30           LXI     H,TBUFF         ;HL=BUFFER ADDRESS
38BC 37         ROUT1   STC
38BD 3F                 CMC                     ;CY=0
38BE 7E                 MOV     A,M             ;A=BYTE IN BUFFER
38BF 1F                 RAR                     ;BIT 0 & 7=0
38C0 77                 MOV     M,A             ;STORE IT
38C1 23                 INX     H               ;GET NEXT ADDRESS
38C2 0B                 DCX     B               ;BC=BC-1
38C3 3E 00              MVI     A,0             ;A=0
38C5 B9                 CMP     C               ;SEE IF C=0
38C6 C2 BC 38           JNZ     ROUT1           ;NOT DONE
38C9 B8                 CMP     B               ;SEE IF B=0
38CA C2 BC 38           JNZ     ROUT1           ;NOT DONE
38CD                    *
38CD                    *       GET READY TO OUTPUT BUFFER
38CD                    *
38CD 16 04              MVI     D,04H           ;COUNT 496 GROUPS
38CF 21 08 30           LXI     H,TBYTE         ;HL=TBYTE ADDRESS
38D2 36 00              MVI     M,0             ;TBYTE=0
38D4 21 0A 30           LXI     H,TBUFF         ;HL=TBUFF ADDRESS
38D7 0E F0      J3      MVI     C,0F0H
38D9 06 01              MVI     B,01H           ;BC=496
38DB 7E         J2      MOV     A,M             ;GGET BYTE TO OUTPUT
38DC CD 1E 39           CALL    PUTOUT          ;OUTPUT
38DF 0B                 DCX     B               ;BC=BC-1
38E0 3E 00              MVI     A,0             ;A=0
38E2 B9                 CMP     C               ;SEE IF C=0
38E3 C2 EA 38           JNZ     J4              ;NOT DONE
38E6 B8                 CMP     B               ;SEE IF B=0
38E7 CA EE 38           JZ      J1              ;496 DONE RETURN PRI
NT HEAD
38EA 23         J4      INX     H               ;HL=NEXT BYTE ADDRES
S
38EB C3 DB 38           JMP     J2              ;GO DO IT AGAIN
38EE 3E 03      J1      MVI     A,03H           ;ETX
38F0 CD 1E 39           CALL    PUTOUT
38F3 3E 0B              MVI     A,0BH           ;VT
38F5 CD 1E 39           CALL    PUTOUT          ;PRINT HEAD RETURNS
38F8 23                 INX     H               ;HL=NEXT BYTE ADDRES
S
38F9 3E FF              MVI     A,255           ;SET DELAY LOOP
38FB 3D         J5      DCR     A               ;DECREMENT A
38FC FE 00              CPI     0               ;SEE IF =0
38FE C2 FB 38           JNZ     J5              ;NO, DO AGAIN
3901 15                 DCR     D               ;D=D-1
3902 C2 D7 38           JNZ     J3              ;GET NEXT 496 GROUP
3905 21 06 30   CKLINE  LXI     H,ELINE         ;HL=ADDRESS OF ELINE
3908 35                 DCR     M               ;ELINE=ELINE-1
3909 C2 04 38           JNZ     POINT           ;NOT END OF SCREEN,D
O MORE
390C                    *
390C                    *       ALL DONE, RETURN TO NORMAL
390C                    *
390C 3E 03              MVI     A,03H           ;ETX
390E CD 1E 39           CALL    PUTOUT
3911 3E 02              MVI     A,02H           ;NORMAL MODE
3913 CD 1E 39           CALL    PUTOUT
3916 3E 0C              MVI     A,0CH           ;FORM FEED
3918 CD 1E 39           CALL    PUTOUT
391B C3 E7 04   SELF    JMP     04E7H           ;REPLACE WITH RET
391E                    *
391E                    *       OUTPUT ROUTINE
391E                    *
391E F5         PUTOUT  PUSH    PSW             ;STORE DATA
391F F5                 PUSH    PSW
3920 DB FF      STATUS  IN      PPORT           ;CHECK PRINTER STATU
S
3922 E6 80              ANI     80H             ;GGET BUSY BIT
3924 C2 20 39           JNZ     STATUS          ;NOT READY
3927 F1                 POP     PSW
3928 E6 7F              ANI     7FH
392A D3 FF              OUT     PPORT
392C F6 80              ORI     80H
392E D3 FF              OUT     PPORT
3930 F1                 POP     PSW
3931 C9                 RET                     ;DONE WITH THIS BYTE
3932                    END     SELF
SYMBOL TABLE

CHAR            3000
EBYTE           3002
EBIT            3003
TBIT            3004
ESYM            3005
ELINE           3006
EROW            3007
TBYTE           3008
TBUFF           300A
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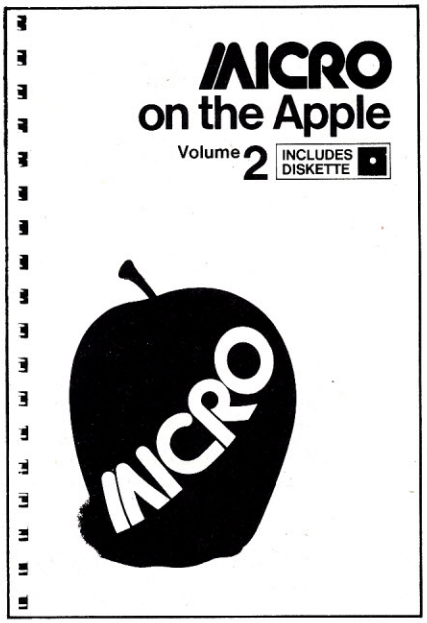
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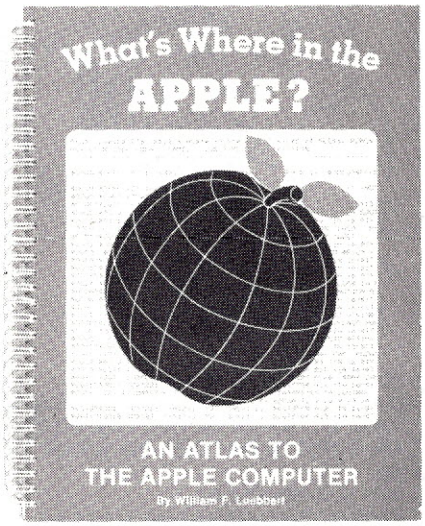
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```
SCREEN          F080
ASCII           F800
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INIT            37CA
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LOOP1           37EE
POINT           3804
B1              380C
A1              381B
TRANS           382B
CHECK           3846
CHECK3          386B
CHECK2          3876
SETCH           388B
CHECK1          389B
ROUT            38AD
ROUT1           38BC
J3              38D7
J2              38DB
J4              38EA
J1              38EE
J5              38FB
CKLINE          3905
SELF            391B
PUTOUT          391E
STATUS          3920

ERRORS THIS ASSEMBLY  0000
```

been done. If they haven't, a jump to "POINT" is made, and the process is repeated. If all 62 characters have been done, a check is made to see if all eight bytes of this Exidy line have been processed.

EROW keeps track of the byte position (0–7) in the Exidy characters you are working with. When EROW is less than 8, CHAR is set to the start of the current Exidy line (all eight vertical bytes haven't been done). When EROW is equal to 8, CHAR is updated to the start of the next Exidy line. (Remember that we only use 62 characters.) No matter what the outcome for EROW, a check must be made to see if we have completed the current 496 byte buffer group (TBIT = 0).

If less than six bits have been shifted into each byte in the current group, TBYTE is decremented to point to byte 1 of the current group. Everything is now ready for a jump to "POINT" and the next 496 bits.

If, however, EBIT, ESYM and TBIT all equal zero, we've shifted the last bit into this buffer group, and we check to see if all four groups have been done (TBYTE = 1984). If TBYTE=1984, we jump back to "POINT" and keep going until all of the groups are full. When TBYTE = 1984, the buffer is full, and you are almost ready to output to the Tiger.

The data is in the buffer, in bits 2 through 7. If you sent this data to the Tiger, there would be a horizontal space across the page, every sixth bit row, starting with bit row 1. This is because the Tiger only has seven print wires (0 through 6). "ROUT" is used to move the data to bits 1 through 6 (remember that bit 0 must equal zero). You can now output the data to the Tiger.

Since you are in the graphics mode, a normal carriage return and line feed would leave gaps in the printout. To prevent this, a vertical tab (ETX = 03H, VT = 0BH) has to be output after each group of 496 bytes. After all four groups have been output and the last VT is sent, a check is made to see if all 30 Exidy lines have been done (ELINE = 0). If ELINE=0 a jump is made to "POINT" and the entire sequence is done again.

Out of habit, and what I consider good programming practice, I return everything to its original state before exiting the routine. I enter the normal mode, return to my original density, and do a form feed before I go to the calling program. The JMP 04E7H sends me back to Micropolis MDOS.

Conclusion

Although I wrote the program for my Sorcerer, using the Micropolis 8080/85 assembler, the concept applies to any system hooked to the Tiger. The key is in understanding how the data gets to your screen, and then transferring it to the vertical six-bit bytes needed by the Tiger.■

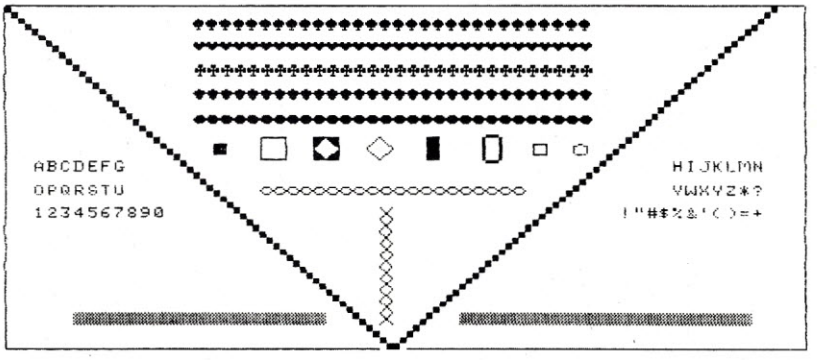


Fig. 3. Sample graphics output.

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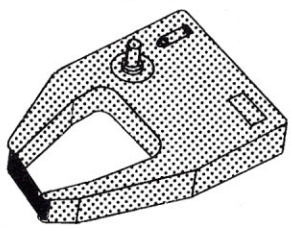
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With a few keystrokes, you can retrieve hours of code entry.

Recover That Lost Code

By Rinaldo F. Prisco

If you've ever spent several hours entering North Star Basic code and then scratched the program without first saving it on disk, this 65-byte machine-language program will help you salvage what you've lost.

Standard configurations of North Star Basic 5.2 (single density) programs are addressed at 24103 (5E1EH). The byte at 5E1EH is the length of the first line of the Basic program and the next two bytes are its line number (low byte, high byte). Program lines end with the ASCII code for CR (0DH). The byte following a CR is the length of the next line. If it is a 01, then the end of the program has been reached.

When a program in N* Basic is scratched (SCR), the first byte in the program area is set to 01 and the next 52 bytes are set to 00. The rest of the program is left intact. To recover it, the remnant program, starting with the first full line left, must be moved to the beginning of the program area.

The Programs

The Recovery program (Listing 1) begins with a search for the first full remaining line by looking for the first true CR (0DH), which signals the end of any partial line that remains. Although it is not very likely, it is possible that the first 0DH might occur in a line number argument for a GOSUB or a GOTO statement. For example, "GOTO 13" or "GOSUB 3300" will have code which includes 0DH (the latter because 3300 = 13*256+2). To avoid misinterpreting such a 0DH for an end of line mark, bytes which reference line numbers are ignored. This is easy enough, since all line numbers that are arguments of GOSUB or GOTO statements are flagged in North Star Basic by preceding them with the byte 9AH. So unless the first or second bytes of the remnant program are 0DHs that refer to line numbers (very unlikely), the first true CR can be found, and thus the beginning of the remnant program.

The first block of the Recovery program searches the code for 0DH beginning with the first nonzeroed byte, skipping over line numbers flagged by 9AH. When it is found, the HL register pair is incremented to the address of the first byte of the first recoverable line and pushed on the stack for later use. The second block searches for the line of unit length. Its address signals the end of the Basic program. The third block determines the number of bytes to be moved and the last block moves them.

Listing 1. Recovery program in North Star Basic.

```
0000                    0010 *          RECOVER
0000                    0015 *
0000                    0020 * SCRATCHED N* BASIC PROGRAMS
0000                    0025 *
0000                    0030 *
0000                    0040 *
0000                    0050 *   RINALDO F. PRISCO
0000                    0060 *
0000 21 52 5E           0070         LXI   H,05E52H      LAST ZERO
0003 06 0D              0080         MVI   B,13          CR
0005 0E 9A              0090         MVI   C,9AH         GOTO FLAG
0007                    0100 *
0007                    0110 * FIND FIRST CR; SKIP OVER GOTO'S
0007                    0120 *
0007 23                 0130 CHECK   INX   H
0008 7E                 0140         MOV   A,M
0009 B9                 0150         CMP   C             GOTO?
000A CA 14 00           0160         JZ    GOTO          YES, SKIP IT
000D B8                 0170         CMP   B             CR?
000E CA 19 00           0180         JZ    CR            YES, GOT IT
0011 C3 07 00           0190         JMP   CHECK         TRY AGAIN
0014 23                 0200 GOTO    INX   H
0015 23                 0210         INX   H
0016 C3 07 00           0220         JMP   CHECK
0019                    0230 *
0019                    0240 * FIND EOF
```

More

Dr. Rinaldo F. Prisco [RD#7, Box 80, Oswego, NY 13126] is an associate professor of mathematics for the State University of New York, College at Oswego.

Listing 1 continued.

```
0019                    0250 *
0019 06 00              0260 CR     MVI   B,0
001B 3E 01              0270        MVI   A,1           EOF MARK
001D 23                 0280        INX   H             1ST FULL LINE
001E E5                 0290        PUSH  H             SAVE IT
001F 4E                 0300 LOOP   MOV   C,M           LINE LENGTH
0020 B9                 0310        CMP   C             IS IT ONE?
0021 CA 28 00           0320        JZ    MOVE          YES, EOF
0024 09                 0330        DAD   B
0025 C3 1F 00           0340        JMP   LOOP          TRY AGAIN
0028                    0350 *
0028                    0360 * PREPARE TO MOVE
0028                    0370 *
0028 EB                 0380 MOVE   XCHG                LAST IN DE
0029 E1                 0390        POP   H             FIRST IN HL
002A 01 1E 5E           0400        LXI   B,5E1EH       DESTINATION
002D                    0410 *
002D                    0420 * SUBTRACT HL FROM DE
002D                    0430 * PLACE RESULTS IN DE
002D                    0440 *
002D 7B                 0450        MOV   A,E
002E 95                 0460        SUB   L
002F 5F                 0470        MOV   E,A
0030 7A                 0480        MOV   A,D
0031 9C                 0490        SBB   H

0032 57                 0500        MOV   D,A
0033 13                 0510        INX   D
0034                    0520 *
0034                    0530 * DE CONTAINS # BYTES TO MOVE
0034                    0540 * HL POINTS TO FIRST BYTE
0034                    0550 * BC CONTAINS DESTINATION
0034                    0560 * READY TO MOVE RECOVERED PROGRAM
0034                    0570 *
0034 7E                 0580 GETC   MOV   A,M
0035 02                 0590        STAX  B
0036 23                 0600        INX   H
0037 03                 0610        INX   B
0038 1B                 0620        DCX   D
0039 7B                 0630        MOV   A,E
003A B2                 0640        ORA   D
003B C2 34 00           0650        JNZ   GETC
003E C3 04 2A           0660        JMP   2A04H         N* BASIC

SYMBOL TABLE

CHECK 0007    CR    0019    GETC  0034    GOTO  0014
LOOP  001F    MOVE  0028
```

```
 1 REM   Test program to be SCRatched and
 2 REM   then recovered by RECOVER program
 3 REM
 4 C=1
 5 DEF FNF(X)=X*X*X+X-3
 6 DEF FND(X)=3*X*X+1
 7 INPUT "HARD COPY? ",Y$:IF Y$(1,1)="Y" THEN P=2
 8 !#P
 9 !#P," n",TAB(12),"x",TAB(25),"f(x)",TAB(38),"f'(x)",
10 !#P,TAB(48),"x-f(x)/f'(x)"
11 FOR I=1 TO 62:!#P,"=",:NEXT I:!#P
12 A=FNF(C):B=FND(C):D=A/B:E=C-D:J=J+1
13 !#P,J,%14F7,C,A,B,E
14 IF ABS(D)<1E-7 THEN END
15 C=E:GOTO 12
```

```
 3 REM
 4 C=1
 5 DEF FNF(X)=X*X*X+X-3
 6 DEF FND(X)=3*X*X+1
 7 INPUT "HARD COPY? ",Y$:IF Y$(1,1)="Y" THEN P=2
 8 !#P
 9 !#P," n",TAB(12),"x",TAB(25),"f(x)",TAB(38),"f'(x)",
10 !#P,TAB(48),"x-f(x)/f'(x)"
11 FOR I=1 TO 62:!#P,"=",:NEXT I:!#P
12 A=FNF(C):B=FND(C):D=A/B:E=C-D:J=J+1
13 !#P,J,%14F7,C,A,B,E
14 IF ABS(D)<1E-7 THEN END
15 C=E:GOTO 12
```

Listing 2. Before and after. The bottom listing shows the recovered program.

A short before-and-after test program in Basic appears in Listing 2. Note that only two REM lines were lost in the recovery. A recovered program will always begin with the first full line left after the initial 53 bytes are deleted.

The 65-byte object code of Listing 1 is stored in a Type 1 file called RECOVER with GO address 0. When a Basic program has been inadvertently scratched, enter BYE immediately, and then GO RECOVER. The recovery is quite fast, even for very large programs. When the Basic prompt READY appears, LIST the program and notice how only a few lines have been lost. Just enter the missing lines and the program is completely restored.

As stated above, the listed program is for standard configurations of release 5.2, single density. It can be modified for other configurations or releases by changing at most three addresses: the address of the first byte of the program area (line 0400), the address of the last byte set to 00 when the program is scratched (line 0070) and the entry point of Basic which retains programs (line 0660). ■

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Editor's Corner

Micros in Space, Again

By Harold Nelson

Microcomputing Technical Editor

It would be interesting to trace the interrelation of the development of computing and the U.S. space program. For example, NASA, as early as 1962, funded artificial intelligence research into life-support techniques and devices for astronauts during lunar explorations. There does not seem to be any single good source of information on how space program research influenced the development of computing, especially microcomputing. Still many people in the field acknowledge that the development of much of the technology leading to our present microcomputers can be traced to research done for NASA and the space program. If we take this for granted—that the space program spawned much of the technology that made microcomputers possible—then microcomputers have recently rediscovered their roots and returned home.

Off-the-shelf microcomputer systems are beginning to appear in space shuttle projects. Microprocessors have been employed as dedicated controllers in space and satellite projects for a few years. But Apple II computers are being used in a few shuttle programs. One is described by Joe Willson of Interactive Structures in his article, "Apple to Earth" (p. 30). Dr. Willson describes how an onboard shuttle project has been developed which employs an onboard Apple. This Apple is scheduled for blast-off later this year.

Another Apple was used in a project at the Jet Propulsion Laboratory (JPL) for the last shuttle flight in November. The goal of this mission was to investigate use of the shuttle as a platform for synthetic aperture radar. The radar data is to be used as a tool to map earth resources in conjunction with LandSat and earth resources of geological data. The whole concept of using radar to locate mineral and oil deposits is still experimental. The task of this particular mission was to collect the radar data then compare it with other satellite (such as LandSat) photos and known geological features that indicate earth resources to determine its usefulness as a resources mapping tool. It appears that this part of the mission was completely successful even though the actual shuttle mission had to be shortened.

Where did the Apple come into play? The JPL mainframe computer is very good at predicting the shuttle's position but it is not readily interactive and it provides no graphics. It was necessary to know where and when the shuttle would be in relation to certain earth targets so targets of special interest could be selected and the radar turned on and off at the appropriate times. The Apple's graphics were used to show the shuttle's orbital path over a surface map. The μSpeed language system was used for the needed interactive high-speed computations on such things as radar parameters.

The mission was praised by the JPL administration for its successes and for the highly successful and harmonious use of the micro and the mainframe. We are obviously delighted that this last point was not overlooked. (By the way, we are planning to publish an in-depth report on this mission, with photos of some of the Apple graphics used at the JPL, in the near future.)

Not only did these two projects use ready-made computers, but both employ readily available products. In fact, the Interactive Structures products, mentioned in Dr. Willson's article, can be seen advertised from time to time in these pages, as can the μSpeed language system of Applied Analytics, which was used in the JPL project. Who would have believed ten years ago that even some of the same computer technology used in space exploration would be available to us in our living rooms?

More on Languages

Last month we devoted *Microcomputing* to discussion of some microcomputer languages. In preparing that issue we discovered, however, that the amount of material and information we wanted to share with you was too great for a single issue. As a result we will, over the next few months, be bringing you additional information on programming languages. Actually, we hardly scratched the surface last month, so we'll be talking more about the languages presented there, as well as others such as Logo, this month (see my report on p. 96), and C, Ada and others in the future.

Forth fans may be interested to know that Applied Analytics' μSpeed language system used in the JPL space shuttle project is a hardware-based Forth variant, which explains its high-speed computational capabilities. Also, you may (or may not) be pleased to learn that Forth aided astronomers in the recent discovery of a rather large hole in the universe. Using a Forth-based system to position telescopes and transcribe the returned images, astronomers at the Kitt Peak National Observatory and the Mount Hopkins Observatory lo-

cated an enormous void in the universe which had gone unnoticed because there are galaxies in front of (from our point of view, for relativists) and behind it. The void is reportedly large enough to contain 2000 Milky Way sized galaxies. Apparently astronomers, among whom Forth is widely used (but, alas, usually on minicomputers), are accustomed to using it for such big jobs.

If you are interested in learning to use the Forth language, I highly recommend *Invitation to Forth,* by Harry Katzan, Jr. (Petrocelli Books, Inc., New York, 1981). Don't be put off by the appearance of the book's dot-matrix printing. It is a very readable book providing a fine tutorial introduction to programming in Forth. The topics covered include reverse Polish notation, the stack and Forth stack manipulations, constant and variable definitions and control structures. If you want to know still more about Forth and Forth-like languages, you might take a look at *Threaded Interpretive Languages,* by R. G. Loeliger (Byte/McGraw-Hill, Peterborough, NH, 1981), which describes the structure and machine implementation of such languages.

Pascal, which is growing in popularity because of the transportability of p-code programs, among other reasons, is now available to 6809 system users and TI 99/4(A) users. Technical Systems Consultants, Inc. has released its 6809 Native-code Pascal Compiler that runs under the Flex and UniFlex operating systems. Texas Instruments has announced its own UCSD p-System and Pascal software packages.

A few interesting packages for the Apple Pascal system have appeared recently. Gryphon Microproducts is producing two Pascal utility packages, PUP1 and PUP2. North American Technology, Inc. has announced six new Pascal software packages available either in source book form or in Apple Pascal disk plus source book form. Included are a File System and a Report Generator. Link Systems is marketing four utility packages including telecommunications and disk manipulation utilities, and an Apple Pascal learning aid (see sidebar).

A number of fine Pascal books are available, including *Pascal User Manual and Report,* by Niklaus Wirth and Kathleen Jensen (Springer-Verlag, New York, 1974), which contains the definition of the Pascal language and the classic text, *Programming in Pascal,* by Peter Grogono (Addison-Wesley, Reading, MA, 2nd Ed. 1980). Neophyte users of Apple Pascal may well find *Apple Pascal: A Hands-On Approach,* by Arthur Luehrmann and Herbert Peckman (McGraw-Hill, New York, 1981), to be indispensable. As the title implies, the book takes you step-by-step through the use of the Apple Pascal system without presupposing prior Pascal experience. It is the first good Pascal book for the rank beginner. For the slightly more experienced Pascal programmer *Software Tools in Pascal,* by Brian W. Kerighan and P. J. Plauger (Addison-Wesley, Reading, MA, 1981), can be very helpful. As you work your way through this book you acquire a number of Pascal programming skills as well as a number of useful programs.

Several microcomputer Lisp interpreters are available ranging from Lisp/80 from the Software Toolworks to (T.(L.C.)) Lisp from the Lisp Company. Beyond the likes of these there are Lisp machines by Lisp Machines, Inc. and Symbolics, Inc. Starting at the high end, Lisp machines are specialized research tools—they are excellent personal (single user) computers that can be had for less than $70,000. While it may not be the computer for your living room, a Lisp machine can be an invaluable computer in many settings. There are, however, a growing number of microcomputer versions of Lisp such as that produced by the Lisp Company for Z-80-based computers running CP/M. Lisp interpreters in this category are more than adequate for most educational and personal uses of the language, and many are in the $150 price range. If you would like to explore Lisp a little before making even that kind of investment, you might be interested in Lisp/80 sold by the Software Toolworks. This is a somewhat pared down Lisp interpreter (available on five- or eight-inch CP/M disks or five-inch HDOS disks) that allows you to, at least, get started at Lisp programming for under $40.

After John Allen's article in last month's *Microcomputing* ("Computing, Lisp and You," p. 28), you might want to read his book *Anatomy of Lisp* (McGraw-Hill, New York, 1978). *Lisp,* by Patrick Winston and Berthold Horn (Addison-Wesley, Reading, MA, 1981), is a fine text that provides 12 chapters on how to program in Lisp and an additional 11 chapters on the use of Lisp.

[*Correction:* Due to a transcription error several hyphens appeared as left arrows in John Allen's article "Computing, Lisp and You." For example, (HORIZ←POS) should be (HORIZ-POS). There should have been no left arrows.]

Finally, in addition to some of the fine microcomputer versions of APL, such as APL/V80 by Vanguard Systems for Z-80 systems running CP/M and Softronics APL for similar systems, there is a low-cost version that serves well for those who merely want to try the language. This version is APL80 sold by Ramware for under $40. It provides a fine introduction to the language and includes several lessons on APL.■

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Read why Logo is more than CAI (Children's Artificial Intelligence, that is).

Logo: Not Just for Kids

By Harold Nelson

Microcomputing Technical Editor

Logo is one of the newest microcomputer programming languages, although it has been around for about 12 years. It was first used on a DEC PDP-10 computer and taught at a Lexington, MA, junior high school in the 1968-69 school year. During that year, seventh graders of varying abilities were taught Logo but no regular seventh-grade math.

According to Seymour Papert, the language's designer (who was recently awarded the annual Marconi International Fellowship for his work with Logo), it was a kind of "baby artificial intelligence course," and at the end of the school year those students scored better on standard math tests than students who had taken regular seventh-grade math.

In the course of the following year, the Logo Project was established in the AI (Artificial Intelligence) Laboratory at MIT. For ten years Logo was developed and tested at MIT and in the schools of Brookline, MA.

Last year, microcomputer versions of Logo were used in schools in Boston, Dallas and New York. Visiting those schools, I was amazed by what I saw.

Whether it was in a fine private school in Dallas, a public school in the Bronx or a special school for exceptional children in Boston, the experiences of the young people using Logo appeared strikingly similar. Many have seen the enthusiasm that computer games and other programming languages can generate, but few have noticed that this enthusiasm involves only a small, technically elite segment of the student population.

But what I saw was something else. With Logo, children were not learning from the machine or with the aid of the machine, rather they were teaching the machine to do what they wanted. Of course, if they wanted the computer to do something that they didn't know how to do, they just learned (usually by means of discovery) what was needed in order to teach the computer. And all of the students were eager for their turns at the computer.

Also, I've had the opportunity to work with the prototypes and, more recently, final microcomputer versions of Logo. My own reactions were not much different from those of the children, except that if I wanted to talk to someone about Logo, until very recently I had to call New York, Dallas or MIT. But that is starting to change. Texas Instruments' TI Logo has been available for some months, and Terrapin, Inc., and Krell Software Corp. have recently announced that they are offering Logo for the Apple computer (see "Microcomputer Versions of Logo, Etc.").

You may get Logo for your children, but they will surely not be the only ones to enjoy, learn and work with it. You may even find after using Logo for a while that you will develop new ways of looking at problems and working out solutions in general. Logo is not just for kids. Many, in fact, are starting to recognize its potential to become the most widely used general-purpose computer language because of both

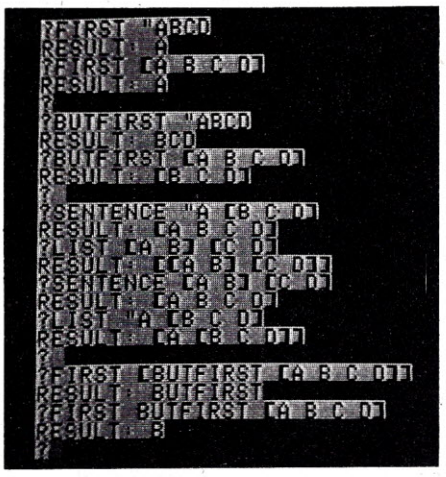


Photo 1. Logo list and word operations. Lisp users and readers of John Allen's article in last month's Microcomputing *will notice that FIRST, BUTFIRST and SENTENCE bear a striking resemblance to Lisp's CAR, CDR and CONS.*

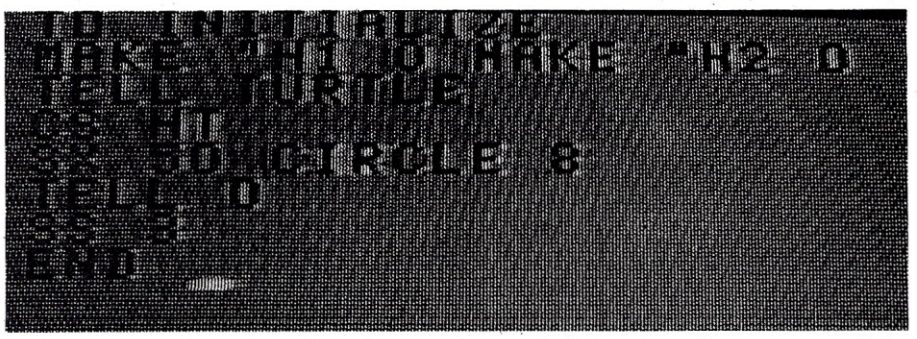
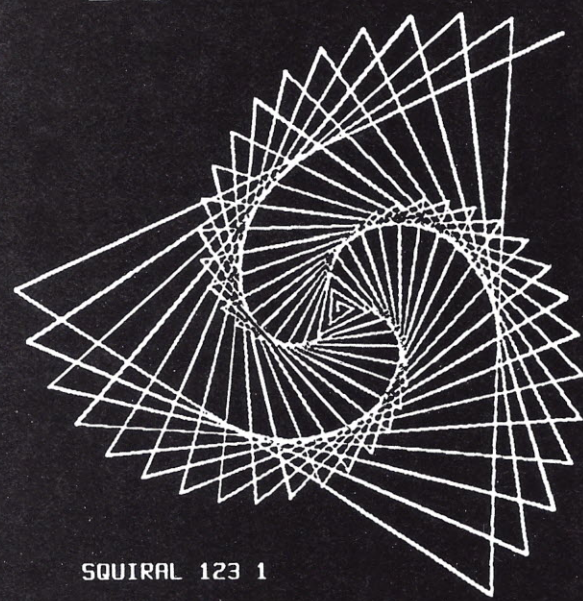


Photo 2. The Logo edit mode. In this mode you can enter and edit procedures. The cursor can easily be moved around the screen allowing you to make insertions, deletions and rearrangements in your procedure.

The Logo Language is Here for the Apple II

```
TO SQUIRAL :ANGLE :DISTANCE
 IF :DISTANCE > 200 THEN STOP
 FORWARD :DISTANCE
 RIGHT :ANGLE
 SQUIRAL :ANGLE :DISTANCE + 3
END
```



SQUIRAL 123 1

Terrapin, the Turtle Company, brings you the Terrapin Logo Language for the Apple II with Turtle graphics, now ready for immediate delivery.

The Terrapin Logo language is a sophisticated and powerful language that is easy for anyone to use. Although originally intended for children, the Logo language is one that the most advanced programmers will enjoy using too. It includes many features common to artificial intelligence research languages permitting programs of great power to be written quickly and easily. Writing comparable programs in other languages is usually much more difficult and time consuming.

The Turtle graphics is fun and easy. With simple commands such as FORWARD, RIGHT, and PENUP you can draw in six hi-res colors. In just a few short sessions you can learn to create figures more complex than the one above whether you know how to program or not.

But the Terrapin Logo language is more than just a graphics language. It supports:

- list structure, allowing easy manipulation of words (strings) and lists
- user defined procedures which can be used exactly as if they were part of the language.
- fully integrated screen editor for procedures and text
- floating point and integer arithmetic
- a total of 120 primitives (commands) including 30 graphics commands
- recursion
- assembly-language interface capability

The Terrapin Logo language was developed by the Artificial Intelligence lab at the Massachusetts Institute of Technology. Terrapin is now authorized by MIT to distribute the results of its 12 years of research to you. To provide quality support for the language, Terrapin has assembled a team that includes two of the three authors who developed the Logo language for the Apple II at MIT, as well as Dr. Feurzeig, the originator of the Logo language.

Every copy of the Terrapin Logo language comes with complete documentation. To run the language, a 48K Apple II with a 16K RAM card or a language card, and one disk drive is required.

Terrapin also offers the robot Turtle, and the following books: *Turtle Geometry, Special Technology for Special Children, Mindstorms, Katie & the Computer,* and *Apple Logo* from Byte Books.

Suggested retail price: $149.95
To order or for more information, call or write:



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Microcomputer Versions Of Logo, etc.

Versions of Logo are currently available for Texas Instruments' TI 99/4A home computer and the Apple II personal computer. The TI version is marketed as a ROM (read-only memory) cartridge or command module. It requires a memory expansion unit, which increases the storage of the 99/4A from 16K bytes to 48K. While not required for the use of TI Logo, a disk controller and disk drive will greatly enhance your use of Logo. The documentation, geared for the young reader, provides him or her with a fine initial introduction to Logo. Also, the turtle is very fast in this version, especially compared to the preproduction prototype of TI Logo.

Logo for the Apple II is currently available from two sources: Terrapin, Inc., and Krell Software Corp. This version was prepared at MIT and recently licensed to these companies. They have added their own enhancement procedures, but the Logo is essentially that described in this article.

This version requires an Apple with 48K bytes of memory and some additional memory expansion which can be in the form of a 16K memory card, an Apple language card or Microsoft's Softcard. One disk drive is also required since the language is contained on disk.

Both Terrapin and Krell are providing their own documentations, which I have not yet seen. Terrapin is, however, including, as part of its documentation, a new book by Hal Abelson of the MIT Logo group. This is an easy-to-read, complete description of the microcomputer versions of Logo. It contains appendices on the differences in different versions and so is an essential resource for all microcomputer Logo users.

It is also my understanding that another version of Abelson's book, called *Apple Logo*, documents yet another version of Logo for the Apple developed by Logo Computer Systems, Inc. (LCSI). LCSI is a company founded by Seymour Papert, Marvin Minsky and other key members of the original MIT Logo group. The company has developed its own advanced version of Logo. LCSI's first implementation of this Logo is for the Apple and others are being contemplated. We'll keep you up to date as information becomes available.

Two other highly recommended books for those using or interested in using Logo are Seymour Papert's *Mindstorms* (Basic Books, Inc., New York, 1980) and *Turtle Geometry*, by Hal Abelson and Andrea diSessa (The MIT Press, Cambridge, 1981). Papert's book is his statement of the Logo philosophy. It contains a complete picture of what Logo is all about.

Turtle Geometry is a textbook unlike any I have ever seen before. It starts (page 5) with a procedure for the turtle to draw a square and concludes with a chapter on the theory of general relativity and curved space, exploring such topics as vector analysis, topology and piecewise flat surfaces along the way. Basic and Pascal, as well as Logo, can be used to carry out the projects in this book, but it is obviously geared to the Logo user.

The Young People's Logo Association, Inc. (1208 Hillsdale Drive, Richardson, TX 75081), was recently organized by Jim Muller. YPLA publishes *Turtle News* and *Logo Newsletter*, which contain information about Logo as well as Logo procedures contributed by members. Jim has done a fine job with YPLA and the publications. If you use Logo, it would be worth looking into YPLA.■ *H.N.*

its power and ease of use.

Logo Modes

Logo is a high-level interpretive language that executes immediate instructions or sequences of instructions written in procedures.

Early versions of Logo were written in Lisp—some still are, but now there are versions of Lisp written in Logo. The obvious resemblance, as we'll see, of some Logo features to those of Lisp, especially in Logo's text (nongraphic) mode, is not surprising.

Logo has a full-screen edit mode for writing, debugging or modifying procedures.

Turtle graphics is probably the best known feature of Logo. In the graphics mode, the Logo turtle (once an actual robot but now a graphics cursor (a mock turtle?)—see "Where Do Turtles Come From?") can be instructed to move around the video display, draw or erase lines and use different colors. In addition, the TI version of Logo features 32 sprites (software creatures) that can be used to create dynamic graphic displays.

Nongraphic Mode

Logo can do mathematics. TI Logo will perform arithmetic (addition, subtraction, multiplication and division) on the integers from −32,768 through 32,767. It will compare quantities by performing "greater than" (>) and "less than" (<) tests. It can also produce random numbers on request (integers 0 through 9).

When using any of these operations, it is recommended that you type PRINT before the operation to be performed. If you simply enter 2+3 or 5>9, the response will be

```
TELL ME WHAT TO DO WITH 8
```

or

```
TELL ME WHAT TO DO WITH FALSE
```

But entering PRINT 2+3 will elicit the response

```
8
```

Entering PRINT 5>9 will produce

```
FALSE
```

Of course, strings containing multiple operations can be evaluated.

The Apple versions of Logo do the same operations on integers in the range -2^{31} through 2^{31} (−2,147,483,648 through 2,147,483,648) and on the real numbers between (approximately) -10^{38} and 10^{38} with decimals as small as 10^{-38}. In addition, it gives the sine (SIN) or cosine (COS) of an angle input in degrees, the arctangent (ATAN) or the angle whose tangent

equals the ratio of two input numbers and the square root (SQRT) of a positive number.

The Apple versions output similar responses to TI Logo with the exception that when something like 2.5*3 is entered (without the PRINT) the response is

RESULT: 7.5

A very nice touch—it is no longer necessary to type PRINT before each math (or list) operation you want performed. (A small user-written procedure in TI Logo could produce the same result.)

The microcomputer versions of Logo contain virtually identical primitives for working with words and lists. (Primitive commands are those that are "built into" Logo—things that Logo already knows how to do.) The word and list operations are very important and powerful Logo features that have received far too little attention. One reason for this is that, even though they are present, there is little mention of them in the TI Logo documentation (which, in most other respects, is quite fine and can easily be used by very young readers with no computing experience).

These operations are well documented, however, in the soon-to-be-published *Logo*, by Harold Abelson of MIT (Byte/McGraw-Hill, 1982). Abelson's book will be of value to the TI Logo user as well as the user of an Apple version. In fact, the book will contain appendices on the differences in the different microcomputer versions of Logo.

Since the word and list operations are so similar in the versions, there is no need to distinguish between them here, but remember that the same output formats used for math operations are used here—in the non-graphic mode.

List operations are very simple means for creating, modifying and combining lists. The same is true of word operations. A word is any character or string of characters. But what is a list? Well, a list is simply a list . . . of numbers, of characters, of words, even of lists or, for that matter, any combination of these. A few of these Logo primitives (whose names tell you what they do) are FIRST, BUTFIRST and SENTENCE. FIRST returns the first item of a word or list. For example,

FIRST "ABCD

returns

A

"ABCD is the way to input the word consisting of A, B, C and D.

FIRST [ABCD]

asks for the first item in the list whose only item is the word ABCD and so gives back

ABCD

The list [LOGO IS NEAT] contains three items and

FIRST [LOGO IS NEAT]

returns

LOGO

Obviously, a list is entered inside brackets.

BUTFIRST gives your list back to you minus the first item.

BUTFIRST [GIVES YOUR LIST BACK TO YOU MINUS THE FIRST ITEM]

gives

[YOUR LIST BACK TO YOU MINUS THE FIRST ITEM]

Lists of more than one element are returned inside brackets.

SENTENCE returns a single list from two or more inputs. Combinations of list operations can produce various interesting results. For example,

BUTFIRST SENTENCE [RETURNS A] [SINGLE LIST]

returns

[A SINGLE LIST]

See Photo 1 for some examples as they appear on the video display. The Readnumber procedure in Listing 3 makes use of a few of the list operations.

Logo contains a primitive called DEFINE that allows you to write a procedure as a list of lists. Another primitive, RUN, will execute a list, that is, make a list do what it says. And since the list operations allow you to modify, combine and create new lists from an old one, Logo gives you everything you need to write programs that can rewrite themselves or write other programs. That's not just kids' stuff. (It is the sort of thing that John Allen had in mind when he referred to Logo and, more generally, working with pro-

Where Do Turtles Come From?

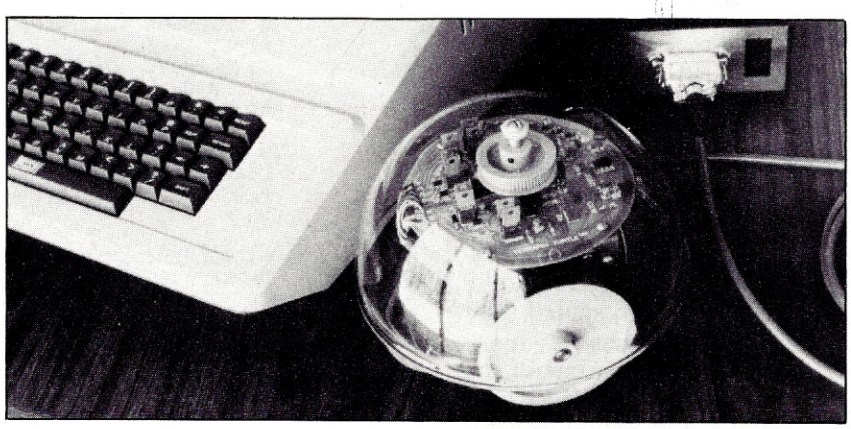
By Jock McClees

The first turtle was built in the 1940s by British cyberneticist Grey Walter, who was studying animal behavior. It uses (by today's standards) a technological primitive—the vacuum tube. Walter's turtle had its own "intelligence." He designed the circuitry so that the turtle sought light like a moth. It operated as an independent entity but was limited to this one task.

The direct progenitor of the

(continued on next page)

Jock McClees is president of Terrapin, Inc., 678 Cambridge Ave., #205, Cambridge, MA 02139.



The modern robot turtle produced by Terrapin, Inc.

(Turtles continued)

modern turtle (such as the Terrapin Turtle) was built at the MIT Artificial Intelligence (AI) Lab for the Logo project. The Logo turtle looked like a large industrial vacuum cleaner. It had devices attached to help it "sense" its surroundings. Touch sensors gave it the ability to "feel" objects in its immediate vicinity. A pen could be lowered to leave a trace of its path. Also, unlike Walter's turtle, the Logo turtle was a peripheral to a large computer and was programmed interactively using the Logo language. The same Logo commands were used to produce screen graphics and, so, were called "turtle graphics."

Some of the MIT AI researchers developed a smaller turtle to introduce to the educational community. They formed a short-lived company (General Turtle) to build and distribute these new turtles. No other Logo turtles had been commercially available, until a group of MIT students founded Terrapin, Inc.

Danny Hillis, while an undergraduate, designed a smaller, cheaper and more reliable turtle. In addition to movement, touch sensors and a pen, Terrapin's turtle added a horn and lights. Originally it was used with large computers, but Terrapin now has interfaces to the Apple II, the Atari and S-100 bus computers. The turtle can be controlled from any high-level language, including Logo.

The robot turtle can help children get started in computer. The turtle has shown particular promise in special-needs education; for example, in working with cerebral palsy, muscular dystrophy and autistic children (see "Logo and the Exceptional Child" by Sylvia Weir in the Sept. 1981 *Microcomputing*, p. 76).

Every new experiment seems to turn up new applications for the turtle. We have seen it used by students of all ages and abilities to explore subjects ranging from elementary geometry to spatial relations to AI techniques. As more and more people learn about the turtle, we should see more and more creative applications for this versatile creature.

grams as data in his article "Computing, Lisp and You" in the Feb. 1982 *Microcomputing*.)

Edit Mode

The edit mode is very similar in both the TI and Apple versions of Logo. It is a full-screen procedure editor.

You can give instructions to Logo either as immediate commands which are executed when entered or via procedures or programs that are executed when the procedure's name is entered (either immediately or in another procedure). To write a procedure, type TO followed by the name of your procedure—think of teaching Logo to do something. This automatically transfers Logo to the edit mode with the name of your procedure listed there (see Photo 2). You simply type in the command lines which may consist of the Logo primitives and the names of other procedures—once a procedure is defined it acts like a primitive.

Logo procedures are usually relatively short compared to those of other languages. Logo can handle

```
TO TRIGRAPH
 HIDETURTLE FULLSCREEN
 COORD
 COSINE 138
 SINE -140
END

TO COORD
 FD 115 BK 230 HOME
 SETXY -140 0 SETXY 138 0
END

TO COSINE :X ; START BY SETTING XY 138 0
 SETXY :X 100 * COS (2 * :X)
 IF :X = - 140 SETXY :X 0 STOP
 COSINE :X - 1
END

TO SINE :X ; START BY SETTING XY -140 0
 SETXY :X 100 * SIN (2 * :X)
 IF :X = 138 SETXY :X 0 STOP
 SINE :X + 1
END
```

Listing 1. Trigraph begins by hiding the turtle, allowing it to draw faster than if it is continually displayed, and putting the display into the full-screen graphics mode (as opposed to the split screen mode which provides for text lines under the graphics portion of the screen). Trigraph then calls Coord, which draws the X-Y coordinate axes. SETXY, followed by two inputs for the values of x and y, causes the turtle to draw a straight line from its present position to the point of those coordinates. Next Trigraph calls Cosine and Sine, inputting the values of x that correspond to the appropriate positions of the turtle. Sine and Cosine are both recursive procedures that have the turtle plot a point then call themselves, changing the value of x by 1, plot another point and so on until the IF tests are passed, the procedures stop and control is returned to Trigraph.

```
TO COILGROW :DISTANCE :ANGLE
 HIDETURTLE
 CIRCLEMOVE :DISTANCE :ANGLE
 COILGROW :DISTANCE :ANGLE - 3
END

TO CIRCLEMOVE :DISTANCE :ANGLE
 CIRCLE :DISTANCE :ANGLE
 FORWARD :DISTANCE
END

TO CIRCLE :DISTANCE :ANGLE
 REPEAT 360/(:ANGLE) [FORWARD :DISTANCE RIGHT :ANGLE]
END
```

Listing 2. It is quite easy and instructive to follow the flow of Coilgrow. After hiding the turtle, the procedure calls Circlemove, which calls Circle. Circle draws a circle whose size is determined by the values input for :DISTANCE and :ANGLE then returns control to Circlemove. Circlemove draws a straight line whose length equals :DISTANCE then returns control to Coilgrow. At this point Coilgrow calls itself, changing the value of the input angle. The only difference on each recursive level is that a slightly larger circle is drawn each time.

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large jobs, but they are usual ly broken down into smaller, more manageable chunks. A Logo program often consists of a main procedure that does nothing more than man age and call other procedures which handle the smaller chunks. In handling their chunks, these called procedures may in turn call other procedures which may call other procedures and on and on. Nesting procedures in this way is very easy and efficient in Logo.

To debug or modify a procedure that has already been written, type EDIT followed by the name of the procedure. This also places Logo in the edit mode, but this time the text of the named procedure appears on the edit screen. This text can be modified by moving the edit cursor to the appropriate places and making the needed insertions and deletions.

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Why Logo Graphics?

Logo graphics are impressive and offer a strong attraction to the language. But why such heavy emphasis on graphics in a language to facilitate learning and thinking? I think it is important to try to answer this since some people (and a few reviewers) have failed to see the real significance of Logo for lack of an answer.

After leaving the University of Paris and prior to coming to MIT, Seymour Papert spent five years in Geneva working with Jean Piaget, the renowned researcher into learning and mental development. Piaget identified certain stages in the intellectual development of children that crossed cultural, social and economic bounds but did appear to be closely connected to chronologi cal age.

> The computer can give access to objects and provide a means for their manipulation that would not be possible in any other way.

For example, children under the age of about six can watch you pour a given amount of water back and forth between a tall thin glass and a short fat one. Still, almost universally, they think that there is more water in the tall thin glass than in the short one.

Many people have taken Piaget's findings as support for the theory that such learning stages are fixed and immutable, possibly originating from physiological development. There is nothing in Piaget's research that would contradict such a theory, but that does not mean they prove it either.

Another theory, equally well supported by Piaget's findings, might say that there is no immutable connection between mental development and age or physiology; rather, such development is connected to the cross-cultural physical stuff (sticks and stones) with which young children interact. This is the stuff from which children construct "models" on which new learning depends. (How many three-year-olds, anywhere in the world, have any opportunity to sit down and pour water back and forth between glasses of different shapes and think about the results of their experiments? And what would happen to that apparent six-year-old breakthrough point if three-year-olds did have such opportunities?) Change the model-building stuff, change the child's "learning" environment and you change the rate of the child's mental development.

This second theory is a rough sketch of the one developed by Papert, which he found to be consistent with Piaget's work and with which Piaget himself found no fault.

Well, theory is one thing, but how do you actually change a child's learning environment? The computer provided the needed vehicle. It can give access to objects and provide a means for their manipulation that would not be possible in any other way. According to Papert, attaining this insight was a real milestone in his own development.

Logo graphics are not designed just to be fun, though they are fun. They are not intended just to entertain, though they do. Logo graphics are designed to give us that new stuff from which we can construct the models we need for new learning.

Graphics Mode

With at least a rough understanding of why they are there, let's take a

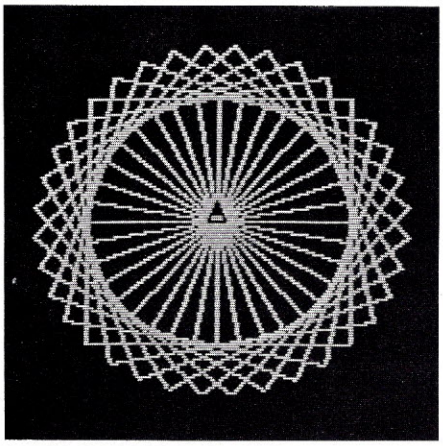


Photo 3. The result of a procedure that has the turtle draw a square, turn a specified amount, draw another square and so on.

```
TO FACTORIAL :N :Q ;[:N CAN BE 0 TO 34 -- :Q MUST BE 1]
 IF :N<2 THEN PRINT1 "N!= PRINT :Q STOP ;[READNUMBER CAN REPLACE
STOP]
 FACTORIAL :N-2 :Q*:N*(:N-1)
END

TO READNUMBER
 PRINT1 SENTENCE [FACTORIAL (N!)] [OF]
 MAKE "INPUT FIRST REQUEST
 IF NUMBER? :INPUT THEN FACTORIAL :INPUT 1
END
```

Listing 3. A program can be made interactive with a procedure such as Readnumber. This procedure is much simpler than it may first appear. PRINT1 prints the "sentence" composed of the indicated lists without a final carriage return. REQUEST looks for a list to be entered. The first item of this list (which may contain only one item) is, if it is a number, assigned to be the first input value of Factorial which is called. Factorial then calculates and prints the factorial of that input number. The procedure then halts or, if you put READNUMBER in place of STOP, another input number is requested. (Notice that anything following a semicolon[;] is not executed. This allows you to enter explanatory remarks in your procedures.) Of course, all the user ever sees after entering READNUMBER is a request to input a number followed (surprisingly quickly) by a statement containing the factorial of that number.

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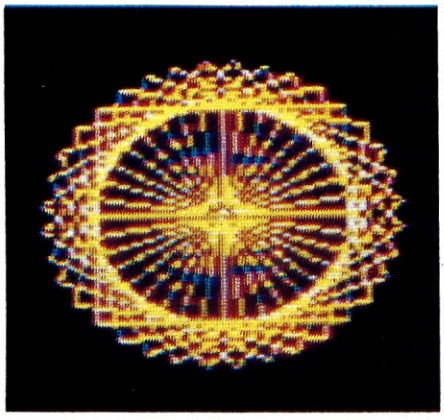


Photo 4. This is produced by the same procedure described in Photo 3, but the turtle has also been told to draw in color.

look at the microcomputer versions of Logo graphics.

All of the microcomputer versions of Logo have comparable turtle-graphics modes. You tell the turtle where to go with simple immediate instructions like FORWARD, BACK, RIGHT and LEFT. The turtle also understands abbreviations: FD, BK, RT and LT. You can tell the turtle when to draw with PENDOWN (PD) and when not to draw with PENUP (PU). These can also be written into procedures containing complete sets of instructions for the turtle (see Photos 3 and 4).

The background on which the turtle draws can be assigned various colors, and the turtle can be told to draw in a variety of colors. The TI and Apple commands for these are slightly different but both are very simple and easy to use.

In addition to regular turtle graphics, TI Logo has built-in sprite graphics. Sprites are creatures that can assume different shapes and colors. They can move in different directions and at different speeds. Sprites, like the turtle, respond to immediate instructions and to procedures. Sprites, by their nature, are dynamic entities and must be seen in action to be fully appreciated (but see Photos 5 and 6 for some "frozen" sprite graphics). Sprites and the turtle can

Dynaturtle

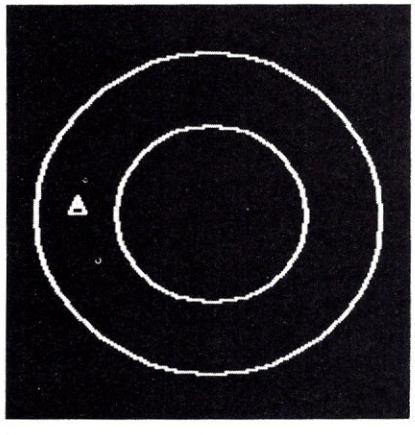


Photo A. Dynatrack by Dan Watt uses an Apple version of Logo.

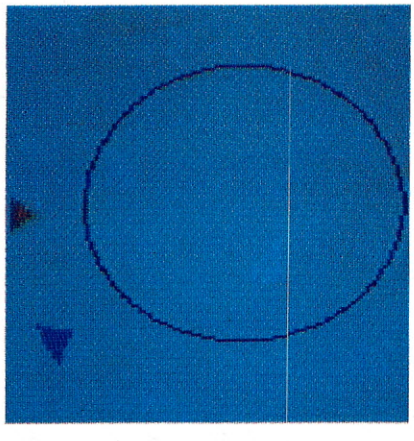


Photo B. Roger Kirchner's Orbit is written with TI Logo.

The dynaturtle (dynamic turtle) is a Logo turtle that obeys the laws of Newtonian physics in an environment without friction or gravity. It acts very much like an object in space. It doesn't move unless it is set in motion by some external force. Once in motion, the dynaturtle continues to travel in one direction at a uniform speed until another force acts on it.

The dynaturtle was developed at

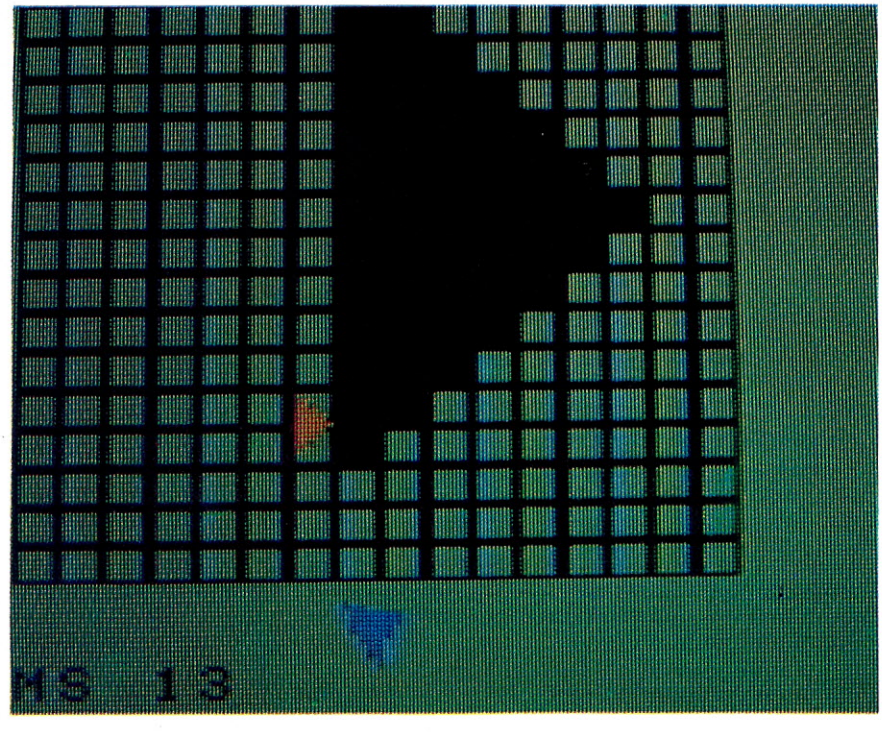


Photo C. MAKESHAPE 11 is one of the 12 shapes that must be made for the Orbit program. MS [MAKESHAPE] 11 will be used by the dynaturtles when they are instructed to make one [30 degree] turn to the right from the original heading. You "draw" the shape by blacking out the appropriate squares of the grid as you move the MS cursor.

be used at the same time (see the Orbit program in the "Dynaturtle" sidebar).

The nongraphics commands can be used in graphics procedures. Listing 1 contains a program that tells the turtle to draw graphs of some trigonometric functions (using the SIN and COS functions with phase and amplitude modified for a better display). The result of this procedure is shown in Photo 7.

When you start to put all of this together you begin to grasp how Logo can offer a child a whole new realm of models to learn with—in fact, it offers an environment in which the child can create his or her own tools to learn with. If you introduce concepts like iteration, nesting and recursion, you begin to see that Logo is something very different from a flashy video-oriented language whose capabilities are soon exhausted.

Working and Thinking with Logo

"Alright, it sounds like Logo is valuable for children, but what does it offer me—what can I do with it?"

MIT by Andy diSessa as a device to help children to learn about physics, but has found its way into physics classes at MIT. A dynaturtle can help to check and develop an intuitive approach toward physics. DiSessa has found that many students (including MIT science majors) have an excellent intellectual grasp of the principles of classical physics but little intuitive feel for those same principles.

Imagine a motionless dynaturtle in the lower-left corner of your video display and a target area in the upper-right corner. Your task is to move the turtle from where it is resting into the target area. You would have no trouble marching a regular Logo turtle up and across the screen, but a dynaturtle marches to the beat of a different drummer.

You set him in motion by giving him a "kick." He will then move in the direction he was facing at the time of the kick. If you give him additional kicks while he is facing the same direction, he will speed up. If you change the direction he is facing and give him another kick, his direction and speed will be the "resultant" of the kicks (forces) in the two directions.

The dynaturtle has also been used to aid the study of circular motion. This use is easily seen in a program called Dynatrack, written by Dan Watt in an Apple version of Logo. Your task here is to get and keep the dynaturtle moving around inside a circular track (see Photo A). You do this by changing the direction in which the dynaturtle is facing and giving it the appropriate kicks. It sounds simple, but reserve judgement until you try it. No matter how thorough your understanding of the physics of circular motion, getting that little creature around that track will teach you an "intuitive" thing or two.

Dynaturtles also inhabit certain regions of TI Logo. Roger Kirchner (from the math dept. of Carleton College) has written procedures, using the TI Logo sprites, for more than one dynaturtle. His Orbit program (see Listing A) sets up two dynaturtles on opposing sides of a circle (see Photo B). The circle represents a planet to be orbited. The dynaturtles (or spaceships) are controlled and respond as described above. Your objective is, of course, to keep one or both of them orbiting the planet.

Dynaturtle procedures are a lot of fun to use and can aid the development of a feel for how certain principles of physics work. Thinking about why certain input patterns work and others don't can lead to insights into classical mechanics. The dynaturtle adds yet another learning dimension to the use of Logo, regardless of the user's age.■ *H.N.*

```
TO ORBIT
INITIALIZE
SETSHIP 1 SETSHIP 2
CONTROL
END


TO INITIALIZE
MAKE "H1 0 MAKE "H2 0
TELL TURTLE
CS HT
SX 50 CIRCLE 8
TELL 0
SS 3
END


TO SETSHIP S
TELL :S
SX 55 * (2 * :S - 3) - 4 SY 8
SS 0 SH 0 CARRY 10
SC 2 * :S + 2
END


TO CONTROL
MAKE "X RC
IF :X = "E THEN KICK 1
IF :X = "I THEN KICK 2
IF :X = "S THEN ROTLEFT 1
IF :X = "J THEN ROTLEFT 2
IF :X = "D THEN ROTRIGHT 1
IF :X = "K THEN ROTRIGHT 2
IF :X = "1 THEN ADJKICK
CONTROL
END


TO CIRCLE SIDE
REPEAT 36 [FD :SIDE LT 10]
END
```

```
TO KICK S
TELL 0
TEST :S = 1
IFT SH :H1
IFF SH :H2
MAKE "DVX XVEL MAKE "DVY YVEL
TELL :S
SV XVEL + :DVX YVEL + :DVY
END


TO ROTLEFT S
TEST :S = 1
IFT MAKE "H1 :H1 - 30
IFF MAKE "H2 :H2 - 30
TELL :S
TEST SHAPE = 10
IFF CARRY SHAPE - 1
IFT CARRY 21
END


TO ROTRIGHT S
TEST :S = 1
IFT MAKE "H1 :H1 + 30
IFF MAKE "H2 :H2 + 30
TELL :S
TEST SHAPE = 21
IFF CARRY SHAPE + 1
IFT CARRY 10
END


TO ADJKICK
MAKE "W WHO
TELL 0
SS F READLINE
TELL :W
END
```

Listing A. The Orbit program by Roger Kirchner. This TI Logo program can be used by entering each of the procedures then making the shapes carried by the sprites in their various attitudes (see Photo C). Each dynaturtle (or rocket) rotates, either left or right, 30 degrees at a time, so it is necessary to use the MAKESHAPE feature to construct the shapes that the sprites will carry in each of their 12 attitudes. When Orbit is run, the blue dynaturtle responds to typing E (to give it a kick), S (to turn left) and D (to turn right). Similarly, the red dynaturtle responds to typing I, J and K. Typing 1 allows you to input a number to adjust the force of the kick.

Logo puts some significant programming techniques readily at your disposal. The techniques of iteration, procedure nesting and recursion can be employed, with varying degrees of difficulty, in most languages. With Logo, it's almost impossible not to use and even become conversant with them. Consider the Coilgrow program in Listing 2. The idea behind this program is very simple—draw a circle, draw a short line, draw another larger circle, draw another short line, and so on.

To have the turtle draw this coil, I made use of all three techniques mentioned above. The Coilgrow procedure is recursive—it does something, then calls itself to do the same thing again, then calls itself. About the only thing Coilgrow does is call another procedure, Circlemove, which calls yet another nested procedure, Circle. Circle draws a circle by iteration of the instructions within the brackets then returns "control" to the Circlemove procedure, which draws a short line from that circle then returns control to Coilgrow. Coilgrow calls itself to start the process over again, but this time with a smaller value for the input angle in order to draw a larger circle.

When I ran Coilgrow, I expected it to draw a nice straight coil across the screen just as I had drawn them on paper as a child. Instead it drew coils with unexpectedly weird bends and twists (see Photo 8). While these coils were interesting, I couldn't understand what was causing the deviations from my plan until I took a closer look at the iterative Circle procedure. Obvious, right?

The Factorial and Readnumber procedures in Listing 3 provide further simple examples of some of Logo's powerful features. Factorial requires two inputs—the number of the factorial and the number one. Factorial does nothing more than test whether or not the first input is less than two. If it isn't, the procedure calls itself, changing the input values as indicated. This continues until the test is passed, after which the value of the factorial is printed out. What is interesting is that all of the work of



Photo 5. The cardinal is made up of several different sprites, each carrying different shapes and colors. When the procedure is run, the cardinal continually runs across the display. (Procedure courtesy of Texas Instruments.)

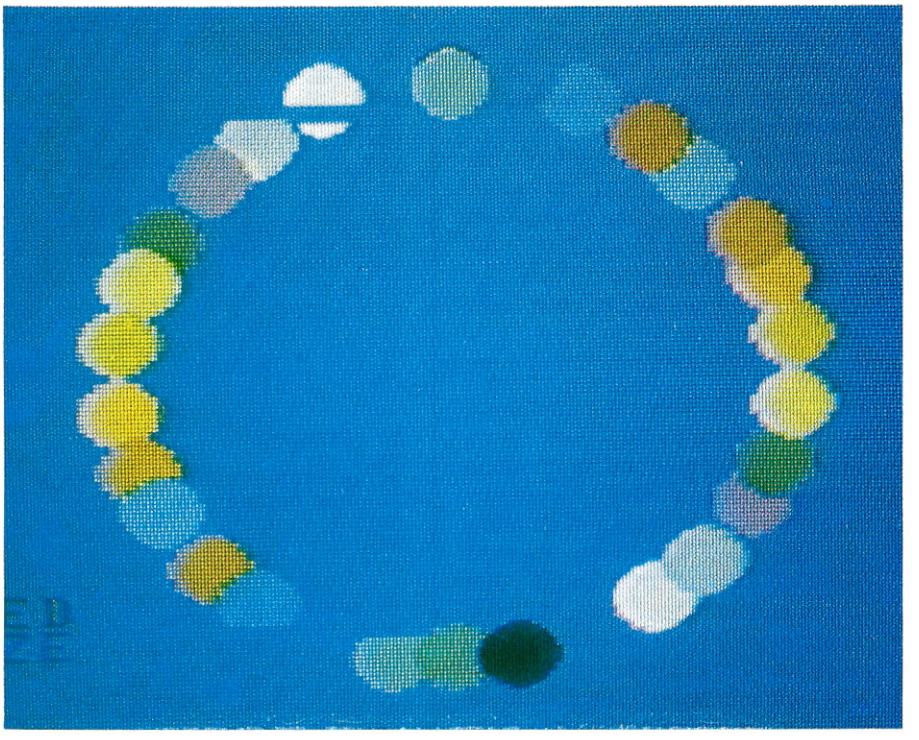


Photo 6. The procedure that produced this display was designed to demonstrate some of the capabilities of sprite graphics. When the procedure is first executed there appears to be one black ball in the center of the display—actually all 32 sprites are "piled" up in the same place. The sprites then begin to move apart each in a different direction and each carrying a differently colored ball. After a few moments they stop, return home to the center of the display and start to fan out once again.

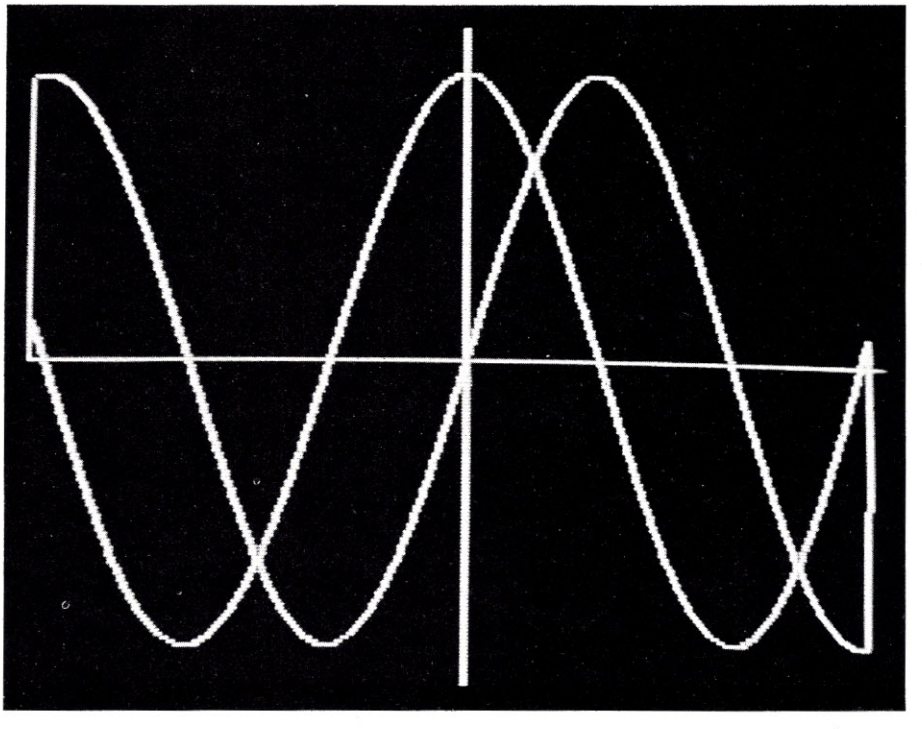


Photo 7. Display produced by the Trigraph procedure (see Listing 1). The turtle first draws the X-Y coordinates, then the cosine curve and finally the sine curve.

calculating the value of the factorial is done in the recursive calls.

Readnumber (also in Listing 3) is an example of how procedures can be made interactive. Readnumber prints a request for your input and, if your input is a number, calls Factorial passing the number you input and one. Factorial calculates and prints the answer. If STOP in Factorial is replaced with READNUMBER, you will be asked for another input after a factorial is printed.

Virtually anything that you can do with Basic, or any other language, you can, usually more easily, do in Logo. You can do all of the mundane tasks that were formerly tedious pencil and paper jobs—most of the computing power in the world today seems to be devoted to performing such tasks. But with Logo you will be seriously tempted to go beyond such traditional uses of the computer. With Logo you will almost certainly end up using the computer as a tool that helps you think about thinking—and that is what artificial intelligence research, in its broadest sense, is all about.■

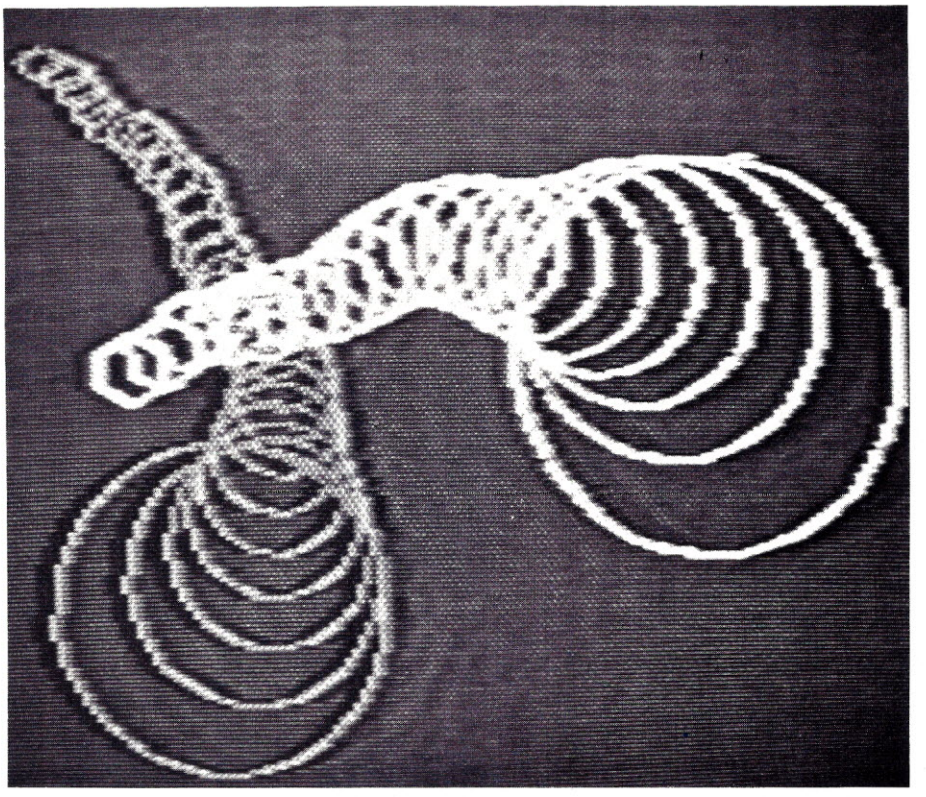
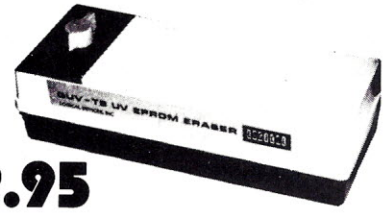


Photo 8. Two coils produced by the Coilgrow procedure (see Listing 2). The only differences are that the turtle started drawing from different places in each case and the values input to Coilgrow were different.

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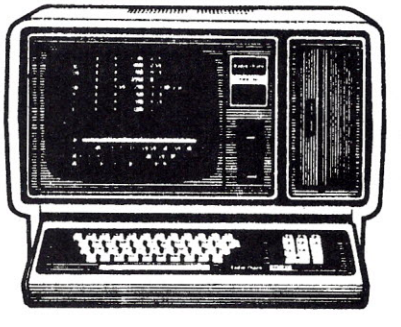
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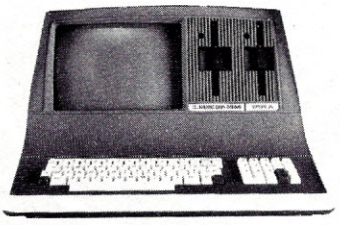
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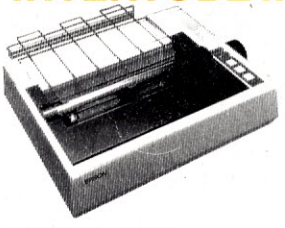
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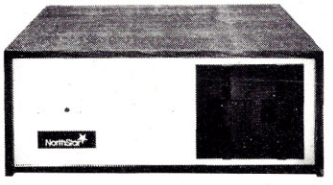
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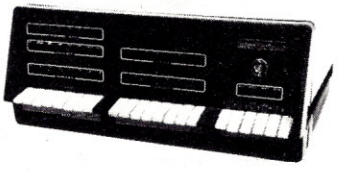
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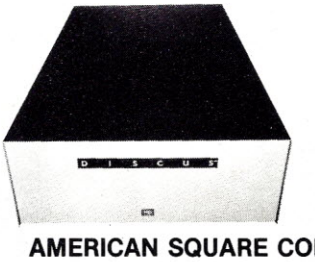
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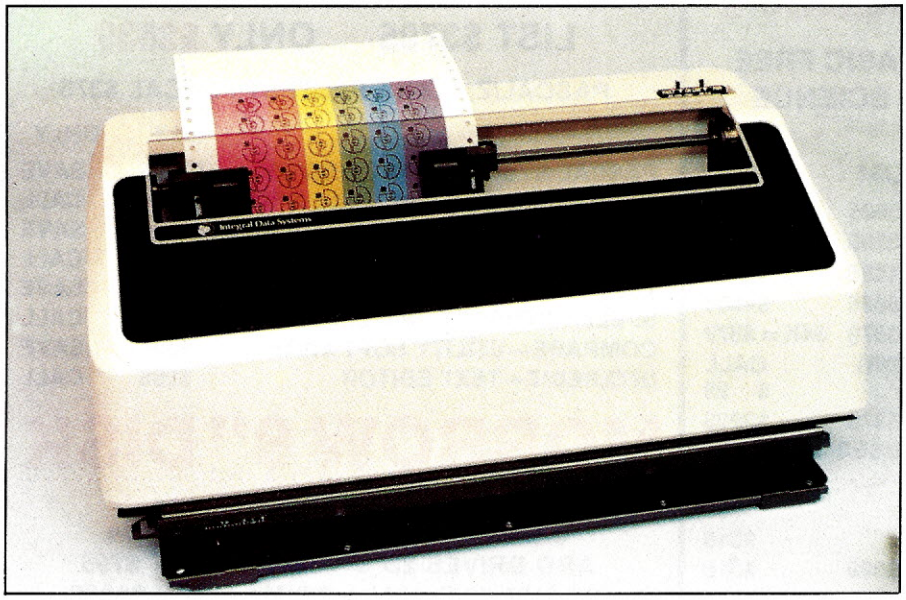
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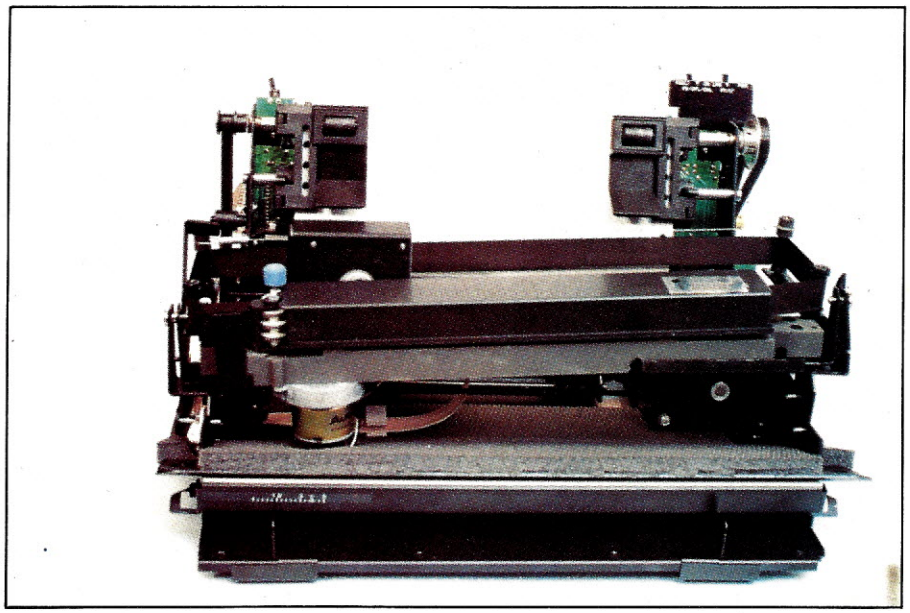
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Color printing needn't be expensive, as IDS proves with its recently released Prism printers.

Parti-Colored Printers From IDS



The Prism 132 printer equipped with the color and semi-automatic sheet feed options. This printer will print color on virtually any type of paper that will fit into the sheet feeder. It will print up to six copies.



Prism 80 with cover removed. The noncolor printers feed the ribbon on a bias path to spread ribbon wear. Black ribbons last about 6 million characters.

By Jim Hansen

People like color in everything they touch. It's not surprising, then, that color printers have received increased attention during the last few years. For business uses, color adds life to otherwise plain computer output. Educational and artistic uses abound. Many graphics applications can exploit color to provide detail not possible with monochrome (single-color) output.

Integral Data Systems introduced two new printers at last November's Comdex show in Las Vegas: the Prism 80, an 80-column color model, and the Prism 132, for 15-inch wide forms. These printers are special because they offer an inexpensive color option as well as a very practical semi-automatic sheet feeder for cut sheet paper such as letterhead stock. Other options for these printers include the "Sprint" option which can nearly double the throughput of the printer, seven foreign character sets and U.S. ASCII. The price of the basic Prism 80 is $899, plus options, putting this printer into the low-cost printer category.

The Prism printers are housed in a cream-colored, foam-rubber-lined heavy case with a clear window above the head area. The main operator controls are positioned near the

Address correspondence to Jim Hansen, PO Box 234, New Boston, NH 03070.

Three Tales Of Color Printing

At the 1980 National Computer Conference (NCC) I found only three color printers on the convention floor. The manufacturers were IBM, Ramtek and Trilog. Each had an interesting approach to color printing.

Trilog showed its Colorplot 100 printer. This printer is a modified Printronics unit that adds an extra set of tractors to give bidirectional paper motion (so the paper can be printed on several times by backing it up) and a 60-yard ribbon divided into three 20-yard color segments. Color changes, which could take some time, involve winding the ribbon to the appropriate color band. Resolution was given as 100 dots per inch, and the printer can take only edge punched (fanfold) stock. A print sample passed out at the convention is shown in Fig. 1. The price of this unit was $9980, plus shipping.

Ramtek, a company specializing in high resolution graphics displays, demonstrated their new Model 4100 color printer. This unit, which suffered from "noisy power" at the show, features separate printheads and ribbon cartridges for each color plus black. This printer has 60 dots per inch horizontal and vertical resolution and is priced at about $12,000.

IBM showed the 3287 printer, a derivative of the $9740 model 3289. As is typical of IBM, the display, the sales pitch and the print samples were conservative. This printer changes colors by moving the head to the right margin and banging into some sort of mechanical arrangement which lifts the ribbon to one of the color bands. The ribbon is about an inch wide and has four colors—red, green, blue and black.

Of the three printers that I found at the show (there may have been more hiding somewhere), the IBM model had the poorest output because of mechanical problems in the paper drive system resulting in horizontal streaking. Only the Ramtek system seemed to be concerned about color balancing and mixing. IBM offered only a process primary ribbon (primary colors) and Trilog listed the three-color ribbon and an all black ribbon. (Users of the Trilog system probably have difficulty mixing black text with the color graphics, since that would require a change of ribbon.)■

—*J.H.*

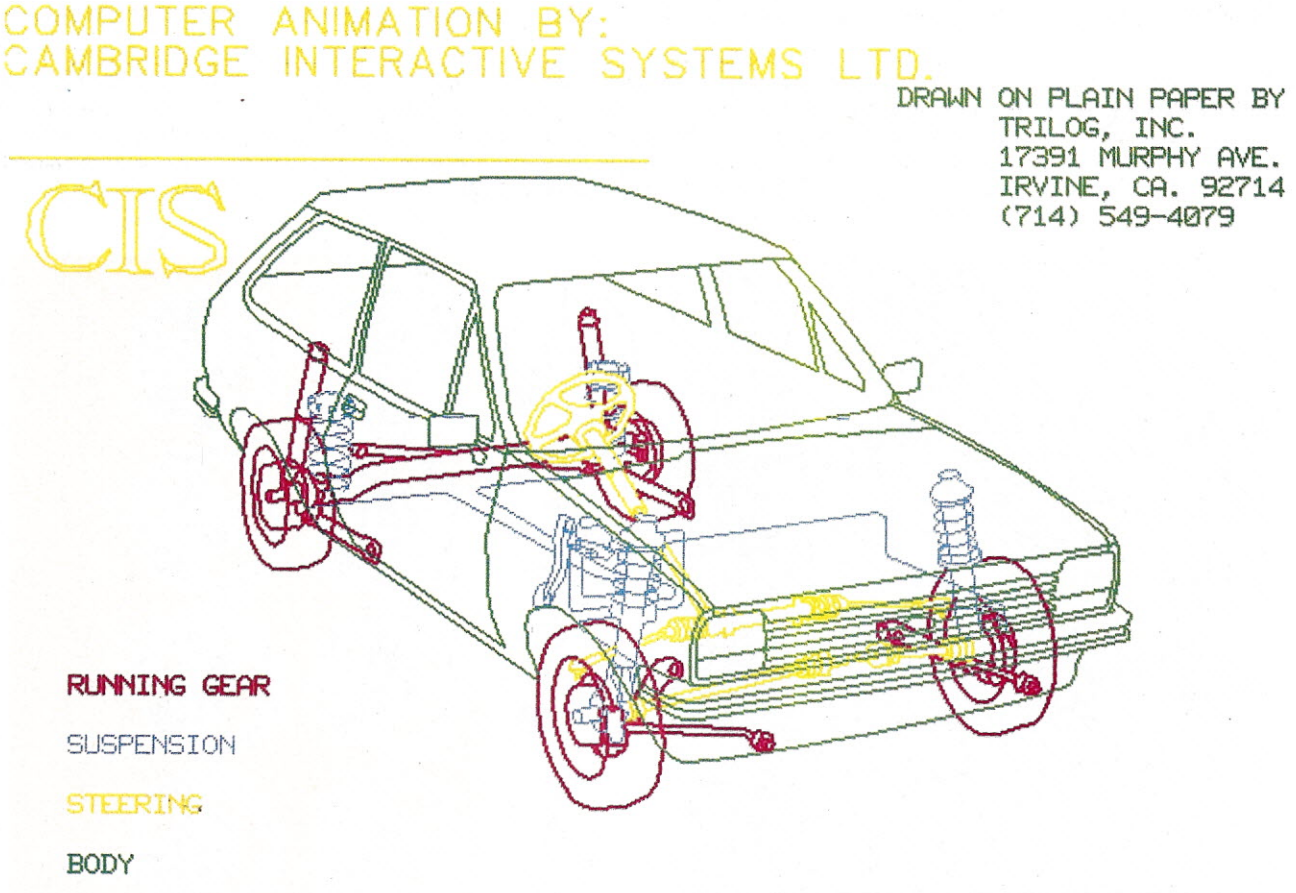
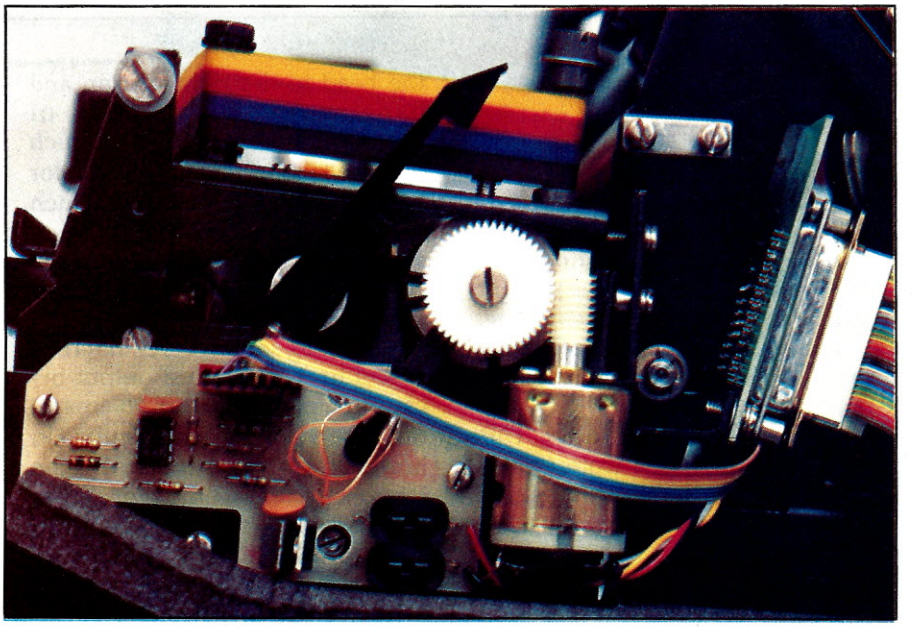


Fig. 1. A print sample from a Trilog Colorplot 100 printer. This printer is essentially a modified Printronics printer. The color ribbon was broken into three color segments. The selected color segment is wound into place using the ribbon drive and can take a fairly long time to access colors on the opposite end of the ribbon. Additional colors can be produced by overstriking combinations of the three colors—e.g., green is produced from the blue and yellow.



The color shifting is done with a small dc motor driving a cam via a worm gear. A notched encoder wheel provides the controller with position information. The forms thickness adjust lever is just to the left of the encoder-cam assembly.

top right corner of the printer. They control on-line/off-line and manual paperfeed operations. The self-test switch and power-on option-select switches are recessed in a slot near the top left edge of the printer.

The back apron has the power switch, power cord and interface connector on it. Both Centronics-compatible parallel and RS-232C serial interfaces are standard.

Paper can be fed from the back, straight up from the bottom or from the front of the printer. Printers equipped with the sheet-feed option can take cut sheet paper or other friction-feed stock. Printer output is ejected from the top of the unit just behind the window.

The window snaps into the case and is easily removed to gain access to the forms-thickness adjustment lever, on the right side of the printer, and the friction/tractor feed selector on the left. There are no other operator controls inside the printer.

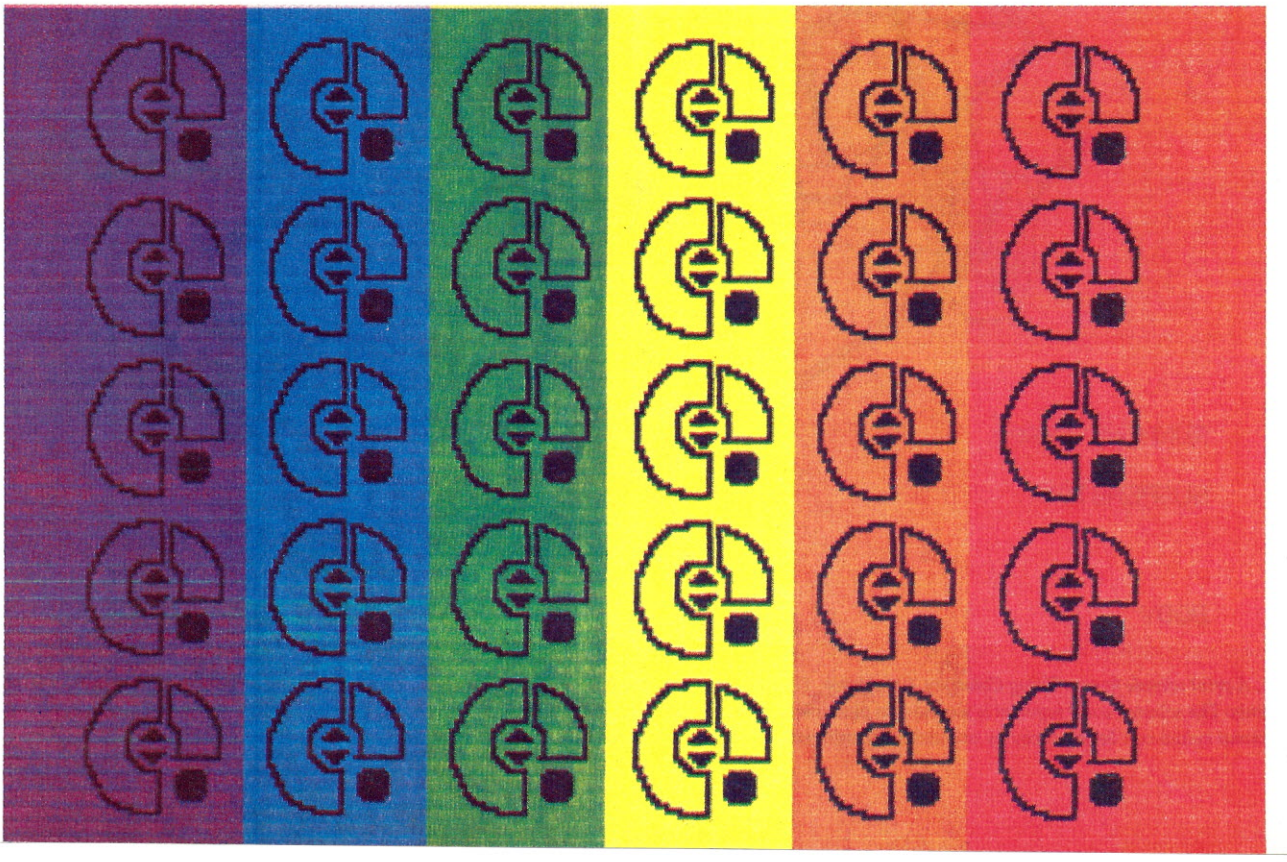
The case is held rigidly to the frame of the printer with a Phillips-head screw in each corner. The printer frame is made of heavy sheet steel with sound-absorbing foam rubber around the base.

The controller and power supply cards are located behind the tractors. The color option, a small PC card with a motor and cam assembly on it, is mounted on the right side of the printer.

The printhead is driven by a large four-pole stepper motor via a timing belt. The head is open-loop operated, meaning that there is no position feedback to the controller.

Paper feed is also stepper-driven with a timing belt. The paper motor and drive belt are located on the right side of the printer, and the lower fric-

Figs. 2 and 3. Color print samples supplied by IDS. The pictures in Figs. 2 and 3 are simply screen dumps from an Apple computer using the Computer Stations 460/560 Screen Dump programs. The images were stored on disk as separations; i.e., one image contained all the yellow parts of the picture, another the cyan, the third the magenta and the fourth the black. The yellow image was loaded from the disk and dumped on the printer using the yellow ribbon. The color was then switched to cyan, and the paper returned to the top of the page using one of the vertical positioning commands. The cyan image was then loaded and dumped. The process was then repeated for magenta and black. Thus, a color dump takes about four times as long as an ordinary screen dump. If the printer is told to print graphics bidirectionally, the print time will be reduced to about twice as long.



tion feed drive wheels are driven by a belt from the tractor mechanism on the left side. Rubber drive wheels on the tractor assembly drive cut sheet stock once it clears the lower drive area.

The ribbon is housed in a stuffer box similar to that used by IBM's model 3287 (see sidebar). Printers without color move the ribbon along a bias path under the head to distribute ribbon wear. Color printers pass the ribbon parallel to the head. The ribbon is moved by a small dc motor and gear box.

The color shift mechanism consists of a small dc motor driving a cam via a worm gear. The cam lifts the entire ribbon assembly to select one of four color bands on the ribbon. Attached to the cam is a slotted encoder wheel for control of ribbon band selection. Ribbon shifting typically takes 100 milliseconds.

The printer controller uses a Motorola 6803 microprocessor. Printer firmware is provided in two 2532 EPROM (erasable-programmable read-only memory) chips (about 8K bytes). The Sprint option is an additional 2716 EPROM (2K bytes). The controller has 2K bytes of random-access memory, of which about 1400 bytes are used for the print buffer.

The power-on options are selected with two DIP switches located next to the self-test switch. These are accessible from the outside of the case. Power-on options are: one of four character densities, six or eight lines per inch, page skip at end of form on or off, automatic line feed on or off, Sprint or correspondence printing, programmable functions enabled, one of eight form sizes, and serial data rate and parity selection if the serial mode is in use. Users with foreign character sets installed can also select which set is used at power up.

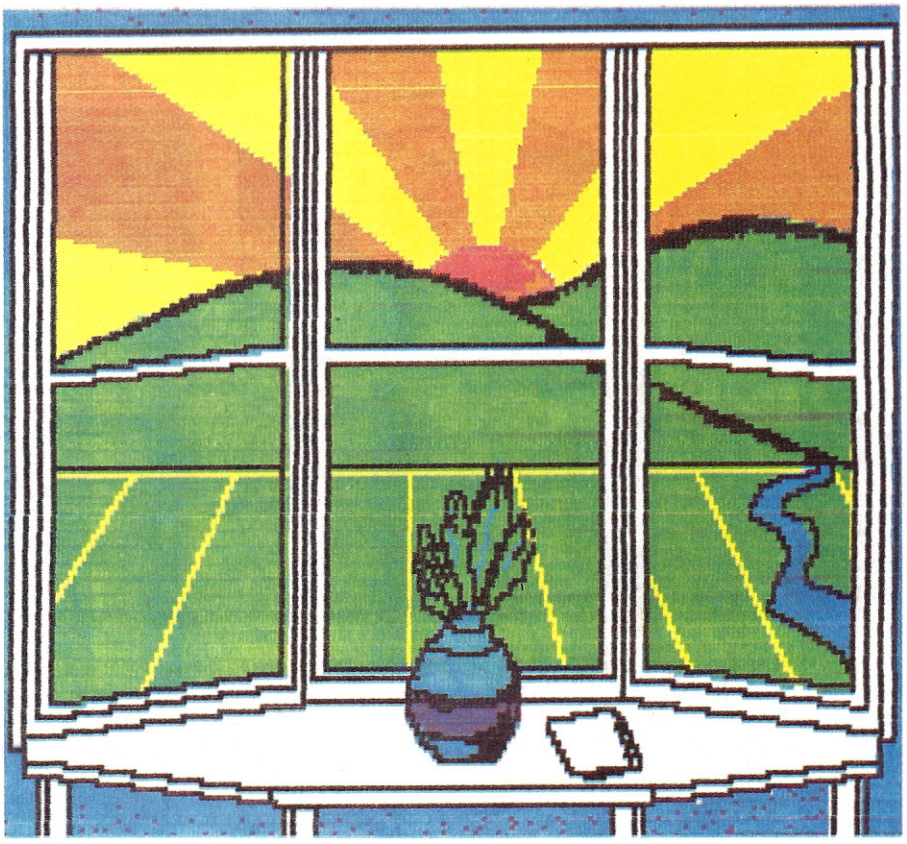
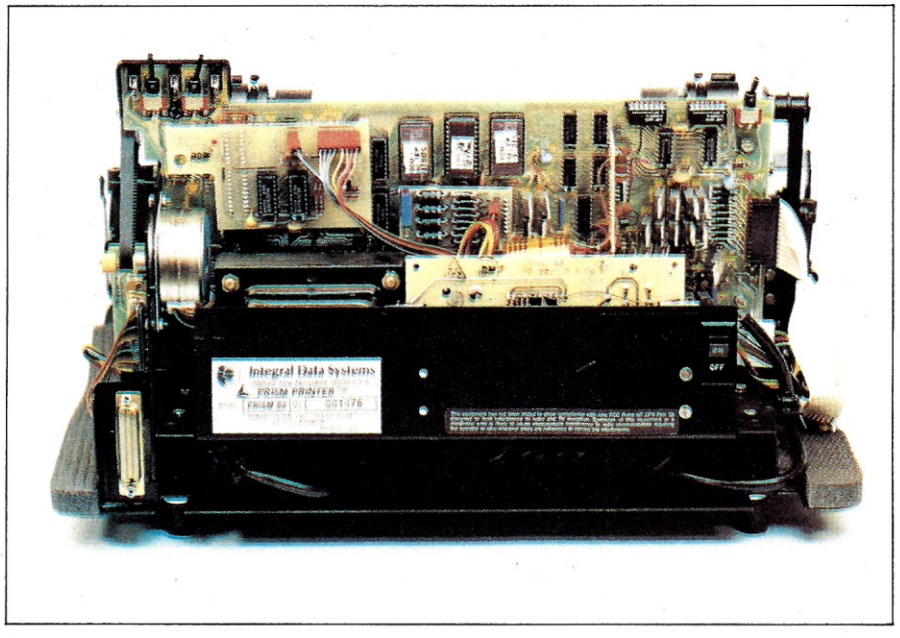


Fig. 3.

The interface selection is made with a jumper near the I/O connector. The RS-232C interface provides both XON-XOFF and data terminal ready signals for data flow control. The interface may be set to most common data rates from 150 to 9600 bits per second. The strobe and acknowledge signals on the parallel interface can be inverted with jumpers.

The self test switch can be activated from the outside of the printer case and prints a rolling ASCII pattern using the printer characteristics and margins as programmed at the time the self test was started.

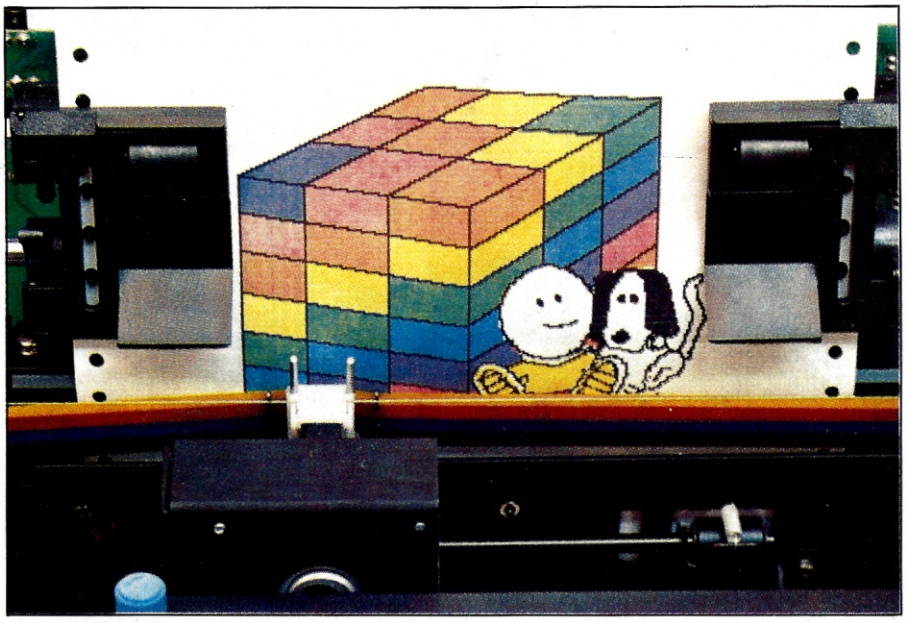


Rear view of the Prism 80 printer with cover removed. The power supply card is mounted on the back apron, with the controller fastened just behind the tractors. The input-output connector is shown in the left corner of the printer (as viewed from the rear).

Features

Prism printers respond to 27 control codes and 17 escape sequences. The escape sequences and all but carriage return, line feed and form feed control codes are disabled when the printer is powered up with the expanded function switch in the disable position.

Control codes are used in the Prism printers to perform carriage returns and select one of the three different line feeds, each separately program-



An Apple Screen dump in progress. This image was printed by dumping the yellow parts of the entire picture first, then cyan, magenta and last black. This helps minimize ribbon contamination caused by picking ink up from earlier passes when overstriking to mix colors. The colors shown were generated by overstriking the entire blocks. Good shades of yet more colors can be obtained by mixing different proportions of the colors from the ribbon.

mable for length and direction; select graphics mode; normal or double width characters; fixed or automatic proportional spacing; one of three print densities; backspace for overstrike; automatic text justification; vertical or horizontal tabs; and uni- or bidirectional graphics printing. The codes also select or deselect the printer.

Several of these features, since they are unusual, need explanation. The Prism printers allow the paper to be moved both up and down. Three line-feed commands are provided, and each may be programmed by an escape sequence. When powered up, advance 1 is set according to the lines-per-inch setting of the power-on option DIP switch. Advance 2 defaults to one-half of this value (for subscripting) and advance 3 is set to minus the setting of advance 2, providing superscript spacing.

The Prism printers offer built-in proportional spacing. Once this mode is selected all text is spaced according to the width of the character. Any character density or width may be printed in this mode.

Automatic text justification is standard on the Prism printers. This feature allows the output to be formatted automatically so that both the left and right margins are straight. In this mode, all text is sent to the printer without carriage returns or line feeds at the end of sentences. The printer fills the lines, justifying them at word boundaries as necessary. Carriage returns are sent at the ends of paragraphs to cause any text remaining to be flushed to the left of the line.

Prism printers support eight vertical and eight horizontal tab positions, which are programmed with escape sequences. Graphics normally are printed unidirectionally. If a small (about ¼- or ½-dot) amount of margin error is acceptable, graphics can be printed bidirectionally with logic-seeking, nearly doubling graphics throughput.

Escape sequences are used to program various printer parameters as well as select a few of the optional features. They can also be used to position the paper and head (actually, the next print position because of automatic logic seek) in special ways.

A consistent format is used for all escape sequences. The ASCII escape code is sent, followed by an escape control character, then the parame-

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16.8 CHARS/INCH: !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■

ENHANCED MODE
10 CHARS/INCH:  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■
12 CHARS/INCH:  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■
16.8 CHARS/INCH: !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■

DRAFT QUALITY PRINTING

NORMAL MODE
10 CHARS/INCH:  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■
12 CHARS/INCH:  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■
16.8 CHARS/INCH: !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■

ENHANCED MODE
10 CHARS/INCH:  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■
12 CHARS/INCH:  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■
16.8 CHARS/INCH: !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~■
```

Fig. 4. Print samples from the Prism printers. Draft quality printing, nearly twice as fast as letter or correspondence quality printing, is available only on printers with the "Sprint" option. The increase in speed (over 200 characters per second) is traded for print quality. All printer features are operative in the draft mode, including proportional spacing and text justification. (All Prism print samples are courtesy of IDS.)

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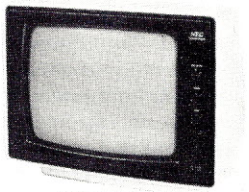
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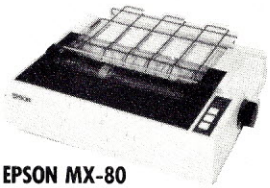
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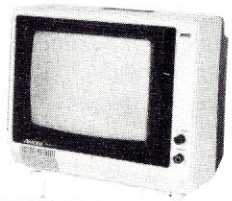
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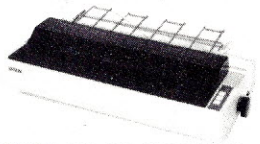
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```
10 REM PRINT SAMPLE PROGRAM FOR THE PRISM PRINTERS
15 CLEAR 1000
20 REM GENERATE TEST STRING
30 FOR X=33 TO 127
40 A$=A$+CHR$(X)
50 NEXT X
60 REM PRINT LETTER QUALITY FONT
70 LPRINT CHR$(27);"R,1,$"
75 LPRINT "LETTER QUALITY PRINTING"
80 GOSUB 500
90 REM PRINT DRAFT FONT
93 LPRINT CHR$(27);"R,2,$";
95 LPRINT "DRAFT QUALITY PRINTING"
100 GOSUB 500
110 LPRINT CHR$(27);"R,1,$":REM SELECT LQ FONT BEFORE QUITTING
120 LPRINT CHR$(2):REM SELECT NORMAL MODE, TOO
130 END
500 REM PRINT OUT THE SAMPLE
510 REM FIRST, NORMAL MODE
520 LPRINT CHR$(2)
530 LPRINT "NORMAL MODE"
540 GOSUB 1000
550 LPRINT:LPRINT CHR$(1);"ENHANCED MODE"
560 GOSUB 1000
570 LPRINT:LPRINT CHR$(2);
580 RETURN
1000 REM OUTPUT EVERYTHING
1010 LPRINT CHR$(29);"10 CHARS/INCH: ";A$
1020 LPRINT CHR$(30);"12 CHARS/INCH: ";A$
1030 LPRINT CHR$(31);"16.8 CHARS/INCH: ";A$
1040 LPRINT CHR$(29)
1050 RETURN
```

Listing 1. The program used to generate the print sample shown in Fig. 4. A string of ASCII characters is generated in lines 30 to 50, and output in a subroutine beginning at line 1000. Line 70 selects the letter quality font then calls the output subroutine. Line 93 selects the draft quality font and then does the same. The letter quality (correspondence) font prints with overlapping dots, while draft does not.

ters separated by commas and spaces. The sequence is ended by any non-numeric character except a comma or space. For example, to program the printer margins to print from three inches to six inches on the paper (leaving a three-inch print line) the command line in Basic is:

```
10 PRINT CHR$(27);"J,360,720,$"
```

In this case, CHR$(27) is the ASCII escape code, J is the control for margins, 360 and 720 are the margin settings in 1/120-inches and the $ is the terminator. (Vertical parameters are programmed in 1/48-inch steps.)

Other commands have as few as one and as many as eight parameters possible. A standard Prism printer will let you program three separate vertical advances for paper motion either up or down and up to eight horizontal and eight vertical tabs, sets the left and right margins, forms lengths and page skip boundaries, changes the intercharacter spacing, and positions the printhead and paper to an absolute position or character/line on the form.

Printers equipped with color use an escape sequence to select the color. A "fifth" color can be selected when using an all-black ribbon. This causes the printer to automatically change color bands at the end of each page to evenly distribute ribbon wear.

An escape sequence is used to select character fonts on printers equipped with either the Sprint option or foreign character sets. The Sprint option lets the printer run in a high-speed "draft" mode where the characters do not use overlapped dots. Table 1, which shows the results of the throughput tests, indicates that the draft mode is a little less than twice the speed of normal correspondence quality printing.

Graphics

Prism printers feature 84 overlapping dots per inch of graphics resolution, both vertically and horizontally. The graphics mode, if available, is selected upon receipt of a control-C (CHR$(3)). Thereafter, the seven least-significant bits in each ASCII character are printed as a column seven dots high. The control-C is used as an escape character in the graphics mode, and must be sent twice to use it as a graphics character. The graphics mode is exited by sending a control-C—control-B sequence.

Semi-Automatic Sheet Feed

The sheet feed option offers a practical way of printing on letterhead stock. This option adds a tray under the front apron of the printer, friction feed rollers and a control lever for se-

```
10 REM TEST TO DETERMINE PRINT SPEED
15 CLEAR 1000
20 A$="THIS IS A SHORT LINE. "
30 B$="HERE IS A LINE OF MEDIUM LENGTH, 42 CHRS. "
40 C$="THIS LINE IS LONG, A FULL WIDTH LINE (WELL, ALMOST.)  IT IS THE SLOWEST ONE. "
50 REM
55 REM INPUT FOR OPERATOR DELAY
56 INPUT Z$
60 REM
70 REM  THIS TEST IS FOR SHORT LINE PRINT SPEED - 100 LINES
80 REM
90 FOR N=1 TO 100:LPRINT A$: NEXT N
100 REM
110 REM DELAY FOR OPERATOR
120 INPUT Z$
130 REM
140 REM THIS TEST IS FOR MEDIUM LINE PRINT SPEED - 100 LINES
150 FOR N=1 TO 100:LPRINT B$:NEXT N
160 REM
170 INPUT Z$
180 REM
190 REM THIS TEST IS FOR LONG LINES - 100 LINES
200 REM
210 FOR N=1 TO 100:LPRINT  C$:  NEXT N
220 REM
225 INPUT Z$
230 REM
240 REM THIS TEST IS FOR MIXED LINE LENGTHS
250 REM
260 FOR N=1 TO 33:LPRINT A$:LPRINT B$:LPRINT C$: NEXT N
270 REM
280 REM
285 INPUT Z$
290 REM THIS TEST IS FOR RANDOM LINE LENGTHS
300 FOR N=1 TO 100
310 ON RND(3) GOTO 400,420,440
320 NEXT N
330 END
400 LPRINT A$:GOTO 320
420 LPRINT B$:GOTO 320
440 LPRINT C$:GOTO 320
```

Listing 2. This program has been used to generate throughput data on all printers tested. In the case of the Prism printers, it was run twice, once for correspondence quality fonts, and once for the draft or Sprint font. The results are shown in Table l.

lecting friction or tractor feed.

Paper guides on the tray are adjustable for any size paper that can be accommodated by the printer. The minimum length of the paper stock usable is limited by how far into the printer it can be pushed (it has to go in five or six inches). IDS has made no provision for printing on envelopes. Paper rolls could probably be used, but no provision has been made for holding them.

The sheet feed (actually, friction feed) mode is selected by moving the selector toward the back of the printer. If no paper is in the printer at this time, it will automatically switch off-line. When a sheet of paper is put into the feed chute, the printer automatically feeds it so the top edge is just above the printhead. The printer then switches on-line, and your computer can print the text on the page in the normal fashion. When finished, the printer should be sent a form feed to eject the printed page. The printer will then go off-line and wait for the next sheet to be inserted.

Test	Type of Data	# Chars Printed	Correspondence Time—Secs	Correspondence Throughput	Draft Mode Time—Secs	Draft Mode Throughput
1	Short Line 21 Characters	2100	43	48.84	29	72.41
2	Medium Line 42 Characters	4200	62	67.74	40	102.44
3	Long Line 75 Characters	7500	95	79.15	59	127.19
4	Mixed, Fixed Order, 99 Lines	4554	84	54.21	52	87.58
5	Random Mix 100 Lines	4596	82	56.05	50	91.92

Table l. Throughput data for the Prism printers. See Listing 2 for the program used for tests 1 through 5. All tests were run on a TRS-80 Model l computer. Times measured with a sweep second hand of a wall clock.

Manual

The preliminary manual supplied with the Prism printers is 8½ by 11 inches and punched for ring binders. It is about 1/3-inch thick and written

```
THIS TEXT IS PRINTED NON-JUSTIFIED, FIXED
 SPACING
The Microcosm was made by Henry Bridges a
nd probably finished shortly before 1734.
What the relationship between the humble
Henry Bridges and the powerful and rich D
uke of Chandos was is still not known.  V
ery little is know about Henry Bridges.Hi
s date of birth (calculated from his chur
ch-yard tombstone) was in 1697.  Contempo
rary accounts describe him as an architec
t and carpenter.  He completed this clock
 after more than eight years' of study.
A 1741 advertisement announced that the M
icrocosm could be viewed at Mitre near Ch
aring Cross and "that Mr. Bridges being e
ngaged in much Business at home would be
willing to sell the machine."
```

```
THIS TEXT IS PROPORTIONALLY SPACED AND
JUSTIFIED
The Microcosm was made by Henry Bridges and probably
finished shortly before 1734.What the relationship
between the humble Henry Bridges and the powerful
and rich Duke of Chandos was is still not known.
Very little is know about Henry Bridges.His date of
birth (calculated from his church-yard tombstone) was
in 1697.  Contemporary accounts describe him as an
architect and carpenter.  He completed this clock
after more than eight years' of study.  A 1741
advertisement announced that the Microcosm could be
viewed at Mitre near Charing Cross and "that Mr.
Bridges being engaged in much Business at home would
be willing to sell the machine."
```

```
THIS TEXT IS PRINTED ON A
TWO INCH LINE
The Microcosm was made by
Henry Bridges and probably
finished shortly before
1734.What the relationship
between the humble Henry
Bridges and the powerful and
rich Duke of Chandos was is
still not known.  Very little is
know about Henry Bridges.His
date of birth (calculated from
his church-yard tombstone) was
in 1697.  Contemporary accounts
describe him as an architect
and carpenter.  He completed
this clock after more than eight
years' of study.  A 1741
advertisement announced that
the Microcosm could be viewed
at Mitre near Charing Cross and
"that Mr. Bridges being engaged
in much Business at home would
be willing to sell the
machine."
```

Figs. 5a, 5b, and 5c. Sample text printed on Prism printers. Fig. 5a (top left) shows the printout without proportional spacing or text justification turned on. Words are arbitrarily wrapped around to the beginning of the next line whenever the line is full. Fig. 5b (bottom left) shows the same text printed after the printer was commanded to justify text and proportionally space the characters. Fig. 5c (above) shows the same text printed as in Fig. 5b, but this time with a two-inch print line. Once again, note that the printer is doing all the text formatting without help of the host computer, which is only supplying the text to be printed.

The Prism printers offer more features
than any other low-cost dot matrix printer.
I was very impressed with the color images printed.

in standard King's English. I found it to be complete and with practical examples of how to program the printer. It includes a glossary of terms in an appendix and a complete listing of control codes at the end of the manual. It's well written and people new to computing or with nontechnical backgrounds should have no trouble understanding it.

Subjective Analysis

There can be no doubt that the Prism printers offer more features than any other low-cost dot matrix printer. I liked the "clean" manner in which they are programmed. The commands are unambiguous and completely compatible. There are no illegal combinations of printer features. Any character size, pitch or font may be mixed with any other, including graphics, on a single line. For example, you can mix draft, proportional spacing and double-size characters in a single line.

The printer is powerful enough that in many cases a text processor to format output may not be necessary. The program in Listing 3 shows how some text would appear if printed normally, then how it appears with automatic justification and proportional spacing turned on. To my knowledge, no other low-cost printer can do this automatically.

I like the backspace feature. Most low-cost printers simply discard the last character received when a backspace code is sent. The Prism printer will actually backspace so that overstrike is possible. This is a useful feature when using APL, or printing mathematical formulas or foreign languages.

I was very impressed with the color images printed by the Prism printer. (I hope they look as good in print as they do in hand.) My opinion is that the rendition of the colors as well as the graphics accuracy is as good as any of the $10,000 printers mentioned in the sidebar.

Three separate ribbons are available for the Prism printers. A process mix ribbon (yellow, cyan, magenta and black) was used to print the samples shown. A process primary ribbon (red, green, blue and black) has about the same ink colors as shown in the IBM print sample. An all black ribbon is available for users of noncolor printers and for when no color is being printed.

IDS claims a life of about 2 million characters per color band on color ribbons, and about 6 million on the all black ribbon. The same ribbon cartridge (a stuffer box system) is used for both the narrow- and wide-body printers.

Business users will probably appreciate the sheet feeder more than hobbyists, but I enjoyed feeding page after page through it. I did not encounter any jams until I fed wrinkled paper, which sometimes got caught under the ribbon. Nearly any kind of stock seems to feed, including onion skin. I even successfully sent through a couple of sheets with carbon paper. The Prism printers will print on forms up to six parts thick.

The graphics, incidentally, are good enough that you could encode your name with them and print it at the bottom of business letters. They could also be used to generate shaded areas in either black or color for making your own invoices, purchase orders and the like.

The printers are fairly quiet. I measured a standard Prism 80 to 63 db; one with the sheet feed option ran about 66 db. By comparison, a Selectric typewriter is usually about 73 db.

There were two things that I did not like about the printers. The paper guides for the sheet feed do not move

```
100 REM program to demonstrate justification and proportional spacing
110 CLEAR 1000:REM PROVIDE SOME STRING SPACE
120 REM PROGRAM MARGINS TO 5 INCH LINES
130 LPRINT CHR$(27);"J,120,620,$"
140 REM SELECT FIXED SPACING, NON-JUSTIFIED PRINTING
150 LPRINT CHR$(6);CHR$(5)
155 LPRINT:LPRINT
160 LPRINT "THIS TEXT IS PRINTED NON-JUSTIFIED, FIXED SPACING"
170 GOSUB 1000
175 LPRINT:LPRINT
180 REM SELECT PROPORTIONAL SPACING, JUSTIFIED PRINTING
185 LPRINT CHR$(16);CHR$(4)
190 LPRINT "THIS TEXT IS PROPORTIONALLY SPACED AND JUSTIFIED"
200 GOSUB 1000
201 LPRINT CHR$(12):REM MOVE TO NEXT PAGE
205 LPRINT
210 REM NOW PRINT ON A TWO INCH LINE
220 LPRINT CHR$(27);"J,120,360,$"
225 LPRINT "THIS TEXT IS PRINTED ON A TWO INCH LINE":LPRINT:LPRINT
230 GOSUB 1000
235 LPRINT
240 REM PUT PRINTER BACK TO A 'NORMAL' CONFIGURATION
250 LPRINT CHR$(27);"J,120,1000,$";CHR$(5);CHR$(6)
260 END
1000 REM OUTPUT ROUTINE
1005 RESTORE
1010 FOR X=1 TO 7
1020 READ A$
1030 LPRINT A$;
1040 NEXT X
1050 RETURN
2000 DATA The Microcosm was made by Henry Bridges and probably finished s
hortly before 1734.
2010 DATA  What the relationship between the humble Henry Bridges and the
 powerful and rich Duke of Chandos was is still not known.
2020 DATA Very little is know about Henry Bridges.
2030 DATA His date of birth (calculated from his church-yard tombstone) w
as in 1697.
2040 DATA Contemporary accounts describe him as an architect and carpente
r.
2050 DATA He completed this clock after more than eight years' of study.

2060 DATA  A 1741 advertisement announced that the Microcosm could be vie
wed at Mitre near Charing Cross and "that Mr. Bridges being engaged in mu
ch Business at home would be willing to sell the machine."
```

Listing 3. This simple program shows how easy it is to generate fairly impressive printouts using only the intelligence in the Prism printers. The information in the DATA statements starting at line 2000 is output to the printer three times. The printer is initially set for five-inch margins in line 130. The text is then sent to the printer to demonstrate the automatic wraparound feature shown in Fig. 5a. Notice how words at the end of the line are arbitrarily wrapped to the beginning of the next line. Next, line 185 commands the printer to justify the text and proportionally space the characters. The results, shown in Fig. 5b, are nearly book-like in appearance. The last demonstration prints the same data, this time with two-inch margins, selected in line 220. The result is shown in Fig. 5c, and looks much like a newspaper column.

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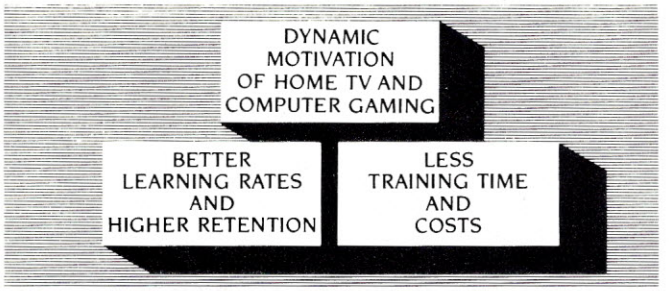
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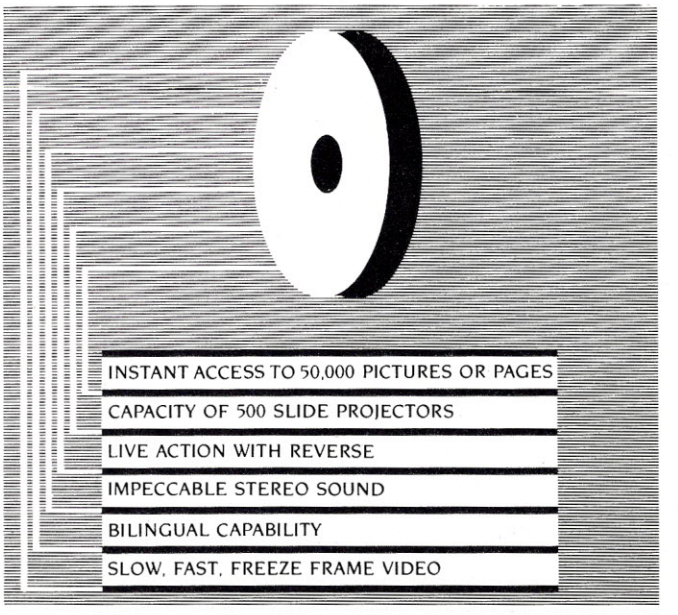
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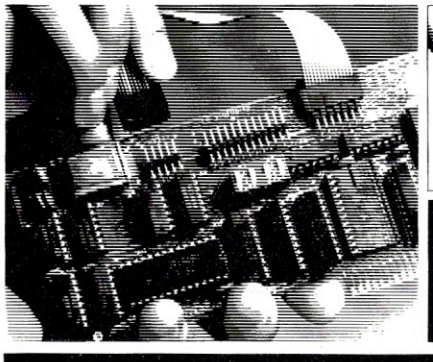
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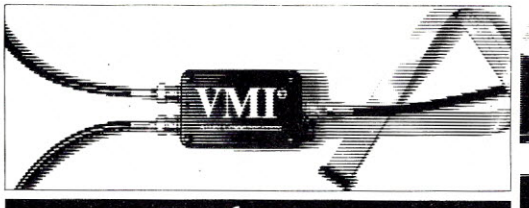
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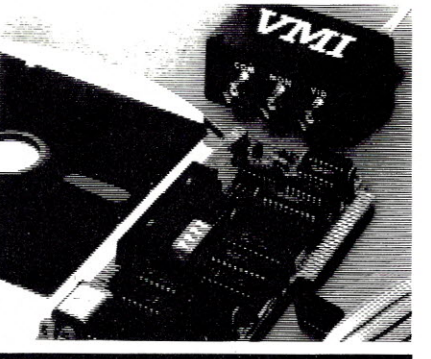
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freely and feel "scratchy"; sometimes they even squeak. The other major complaint is that the plastic window has a sound baffle so that you cannot watch the text as it is being printed. (I happen to like watching it as soon as it is on the paper.) With the window in place printing takes place a couple of inches below the baffle.

In summary, I found the Prism printer to be faster (about 30 percent above the Epson MX-100 when compared in the correspondence mode) than any other printer in the low-cost area. The fonts are crisp. The printers have no competition in the "smart printer" class. When IDS mentioned "affordable" color, they meant they chopped something like $8500 out of the cost of a color printer but retained print quality and color balance better than most and at least as good as those I saw at the NCC.

IDS has made a good product and supports it with an extensive service network. If you are looking for a medium- to heavy-duty printer for business or home, and want a first-class American product, you might want to look at the Prism printer line.■

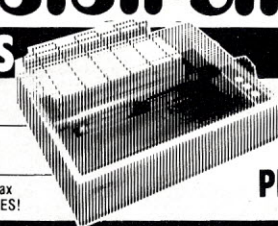
Feature Summary Table

Except for carriage width, features are the same for both the Prism 80 and Prism 132 printers.

Print Characteristics			
Densities (Chars/inch)	10	12	16.8
Double Width	Y	Y	Y
Proportional Spacing	Y	Y	Y
Underscore	Y	Y	Y
Justification	Y	Y	Y
Fonts			
Character Sets	8		
Line Density (Lines/inch)	6/8 Also programmable in 1/48 in. steps		
Form Lengths	3, 4, 3.5, 7, 12, 11, 8.5, 14 inches. Also programmable in 1/48-inch steps		
Printer Throughput	54 cps (correspondence), 87 (draft)		
Graphics	Dot mapped, 84 dots per inch vertical and horizontal		
Color	4 color printing optional		
Mechanical			
Ribbon	36 yards × 1 inch wide in stuffer cartridge		
Paper Types	Friction feed rolls or sheets, punched fanfold		
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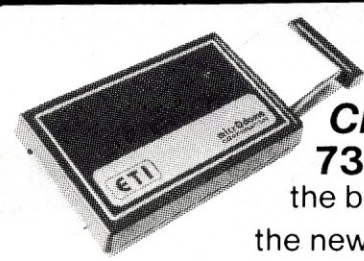
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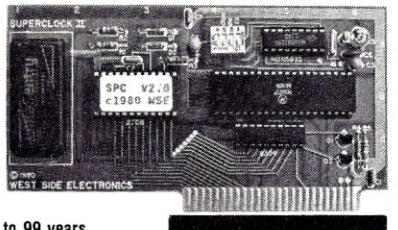
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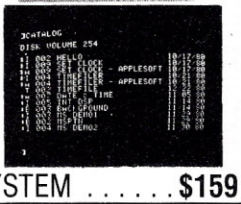
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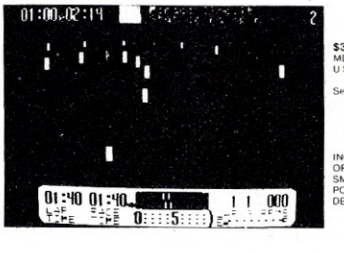
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A clock calendar device from QT Computer Systems is accomplishing its mission in New Guinea.

Spreading the Good Word Of Computing

By Jan Messersmith

One of my tasks as manager of computers for Pioneer Bible Translators is to keep our Imsai-based Z-80 system up and running amid the extreme climatic conditions encountered here in Papua New Guinea. The computer is used by staff members involved in translating the Bible and other books into the local languages.

One of the problems we face is assuring that a translator steaming in his jungle hut can look at a vocabulary dump or a trial translation and know for sure that he has the latest printout. The simplest solution seems to be some sort of hardware that always knows the correct time and date. The slickest device I have seen for this purpose is provided by QT Computer Systems, Inc., of Lawndale, CA.

We will use this device for time and date imprinting of hard copy by incorporating the data from the board in a print utility similar to the TYPE facility in CP/M. Another use will be automatic logging of use by different translators to see which programs are popular (useful) and which need human engineering to make them easier to use and more efficient. Periodic measurements are a cinch with this little gem. And, we can always impress the neighborhood with our $8000 digital watch.

The circuit has four hardware interrupts which can also be used as interval timers. These are one millisecond (actually 1024 Hz), one second, one minute and one hour.

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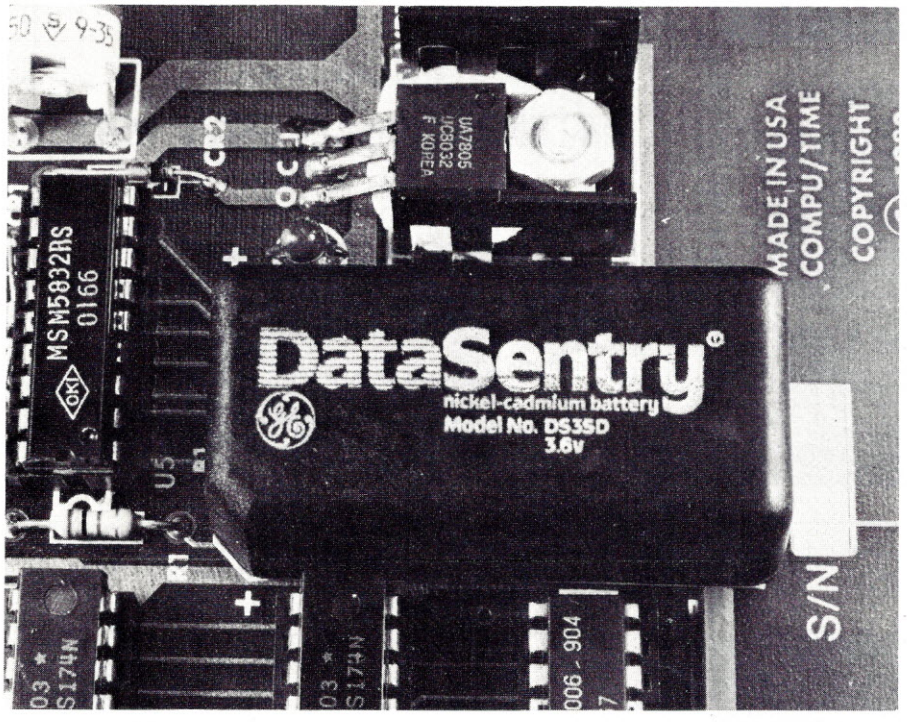


Photo 1. A photograph of answered prayers. General Electric's DataSentry will power the clock/calendar independent of the system for months. I understand that the assembled and tested version comes already set and running with California time. The white object above the clock chip is the trimmer capacitor. Unfortunately, it faces the right end of the board instead of pointing up. It is a little difficult to adjust it when the board is inserted in the card cage. (The top edge of the board is pointing to the left in this photograph.)

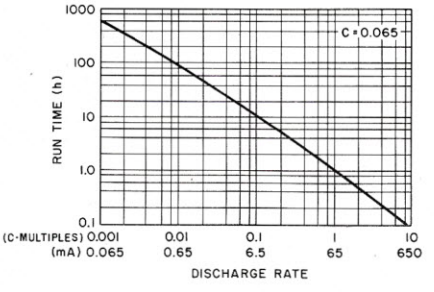


Fig. 1. This is the run time graph from the DataSentry spec sheet. A little mental extrapolation of the graph line to where it would meet with a 30 microamp discharge rate looks like something well in excess of 10,000 hours. That's almost 14 months. The battery is able to withstand continuous overcharging. (Courtesy of General Electric Company.)

Jan Messersmith is an administrator in charge of computers, finance and publications for Pioneer Bible Translators, Box 178, Madang, Papua New Guinea. He and his family live in Madang and provide support services to the translators living in the jungle villages.

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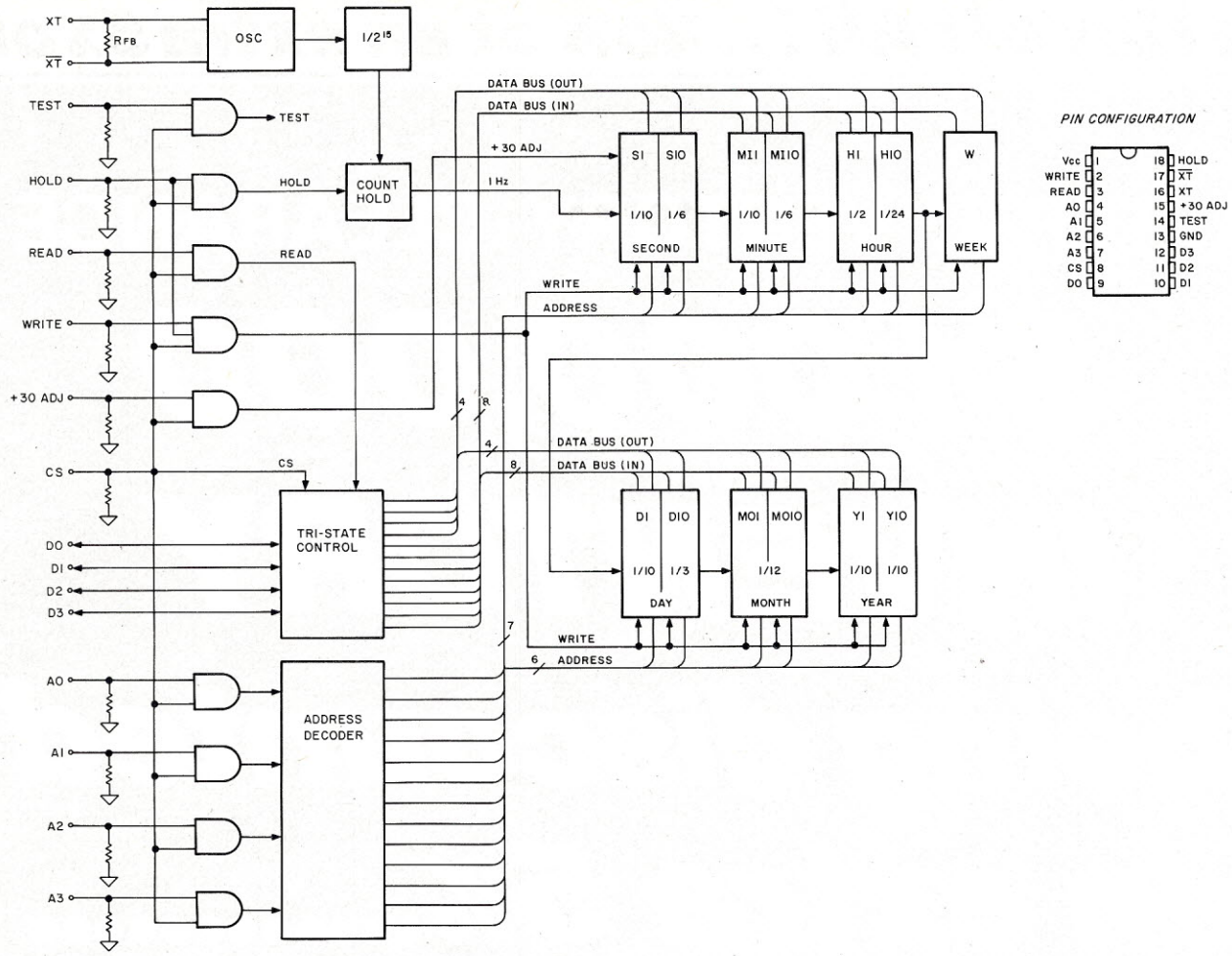


Fig. 2. The block diagram of the OKI Semiconductor MSM5832 RTC/Calendar chip shows the register layout and control lines. The +/– 30 second adjust is very handy for accurate setting and periodic minor adjustments. (Courtesy of OKI Semiconductors.)

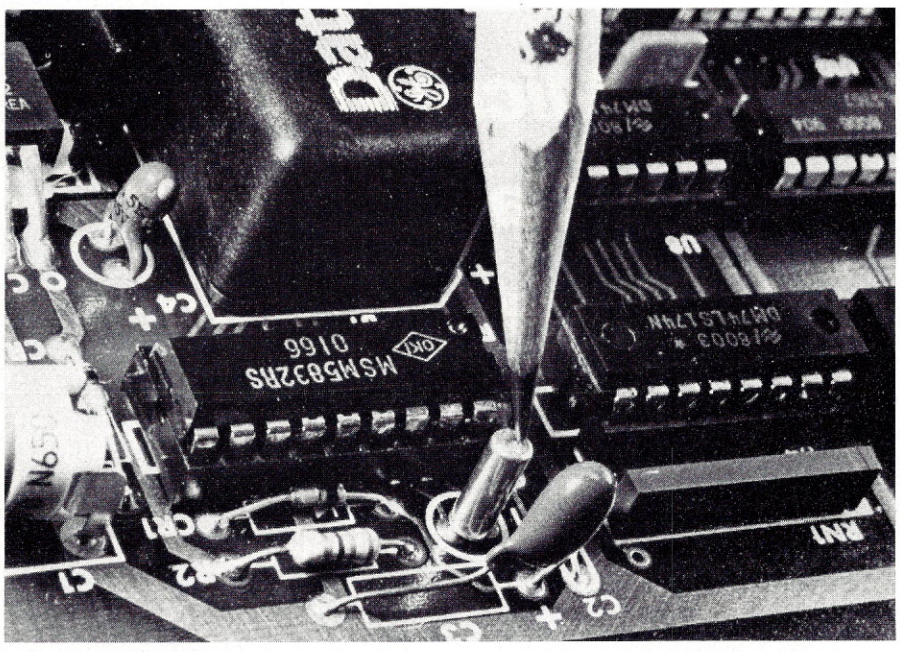


Photo 2. This photo shows some of the points discussed in the article. The pencil is pointing to the dinky crystal with the hair-like leads. In front of it is the capacitor whose shape is different from the symbol on the board. To the right is one of the single-in-line resistor networks which ease assembly. To the rear of the crystal is the OKI clock/calendar chip and behind that is the end of the GE DataSentry. (The bottom edge of the photograph is the top edge of the board.)

on the board, the better off I am (there are *no* computer shops in Papua New Guinea). It seems as if $100 is a lot for so few parts, but after building the kit and using it, I'd pay twice the price.

First, let's look at the beautifully simple battery backup. Photo 1 shows the General Electric DataSentry PC mountable nicad battery. I contacted GE for information about this product, and they sent me a spec sheet on the DataSentry line. This document contained an interesting little graph (see Fig. 1) of the discharge characteristics of the 3.6 V device (they also have a 2.4 V model). This graph, coupled with the 30 microamp standby current drain of the clock chip and some extrapolation of graph lines, shows something in excess of 10,000 hours of backup time. That's nearly 14 months!

The battery solders directly to the PC board with four pins and cannot be installed backward. It is designed for long life at high temperatures and can withstand continuous overcharging.

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The next item of interest is the clock chip itself, an MSM5832 real-time clock/calendar by OKI Semiconductor of Santa Clara, CA (see block diagram in Fig. 2). As you can see from Photo 2, it is an 18-pin DIP, a much neater package than the usual 28- or 40-pin devices used in real-time clocks.

I must, however, interject a few sour notes into this fugue of praise—the manual is less than sublime. If anyone out there has ever assembled a kit in which every single instruction matched every part included and the little holes and cryptic legends silkscreened on the board likewise agreed, please let me know; I'd like to buy one just to have the pleasure of building it.

Four installation steps in the manual are potentially confusing. Refer again to Photo 2 for a look at one of the three single-in-line package resistor networks. These make the assembly much easier, but notice that the pin 1 end is marked by a shallow indentation on the top. This was not spelled out in the manual, but rather assumed by me, something I dearly hate to do when building a kit.

Notice also that the tantalum capacitor located at C3 clearly does not match the silkscreened symbol on the board. This is not such a big deal actually, because if you're like me, you put in the parts you're sure of first and then use what's left wherever it seems to make the most sense. That really comes in handy for the crystal (under pencil point), which has absolutely no markings on it and looks nothing like the crystals I'm used to. The wires coming out are incredibly tiny and the manual warns that it is fragile.

Finally, we're left with one resistor and one place for it. Unfortunately, it's not red-red-red (2200 ohms) as the manual flatly states. It is instead orange-orange-orange (33,000 ohms). I called QT and told them that I might have to make just a few negative remarks about the manual. I was promised that a new manual was forthcoming.

Another glitch reared its ugly head when I attempted to run the Basic program included in the manual. I got only nonsense from the board. It took me a half-hour of fretting, head-scratching and probing around with a scope to discover that it was because I had altered the address of the board and had changed the addresses in the program to what I *thought* they should be. It is not immediately apparent from examining the manual

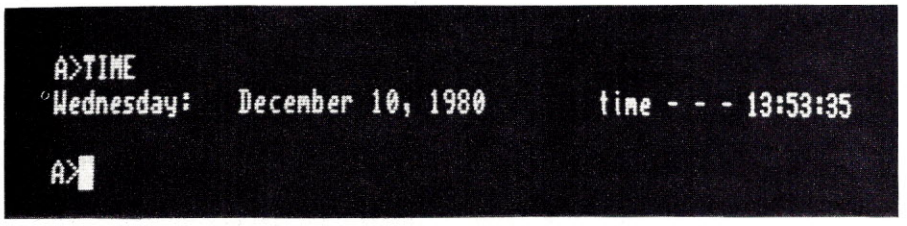
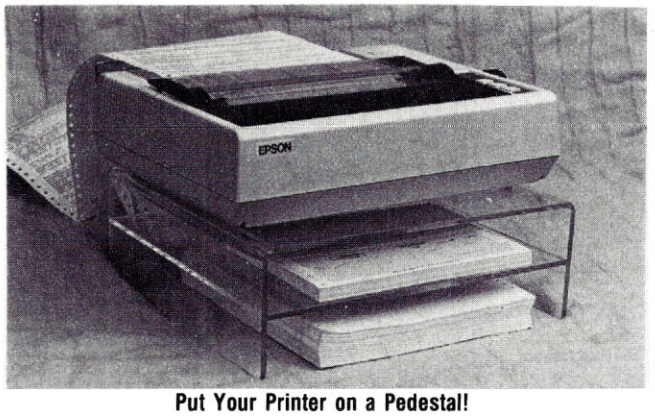


Photo 3. The output of the program listed in the article. Various video attributes can be set on terminals capable of them, for blinking, inverse video and low intensity, which really increase the zowee factor.



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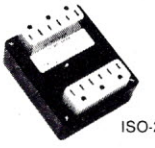
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that, of the four-port block addressed by the DIP switch on the board, the second and third ports are used by software and not the first and second.

The Basic program included in the manual is adequate for most simple time reading and setting purposes, but I wanted to integrate the

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-d100
0100 31 AB 02 3E 10 D3 BD 7F AF 3C FE 0D C2 09 01 3E 1..>.....<.....>
0110 26 CD A3 01 21 CE 01 CD B5 01 3E 2A CD A3 01 07 &...!.....>*....
0120 F5 07 07 C1 80 F5 3E 29 CD A3 01 C1 80 21 23 02 ......>).....!#.
0130 CD B6 01 3E 28 CD A3 01 E6 03 FE 00 CA 42 01 CD ...>(........B..
0140 AE 01 3E 27 CD 9C 01 3E 01 21 99 02 CD B6 01 3E ..>'...>.!.....>
0150 2C CD 9C 01 3E 2B CD 9C 01 3E 01 21 85 02 CD B6 ,...>+...>.!....
0160 01 3E 25 CD A3 01 E6 03 CD AE 01 3E 24 CD 9C 01 .>%.........>$...
0170 0E 3A CD F1 FD 3E 23 CD 9C 01 3E 22 CD 9C 01 0E .:...>#...>"....
0180 3A CD F1 FD 3E 21 CD 9C 01 3E 20 CD 9C 01 3E 01 :...>!...> ...>.
0190 21 9E 02 CD B6 01 AF D3 BD C3 00 00 CD A3 01 CD !...............
01A0 AE 01 C9 D3 BE C3 A8 01 C3 AB 01 DB BE C9 F6 30 ...............0
01B0 4F CD F1 FD C9 3C 3D CA C1 01 5E 16 00 19 C3 B6 O....<=...^.....
-d
01C0 01 7E 23 3D C8 4E F5 CD F1 FD F1 C3 C2 01 0B 53 .~#=.N.........S
01D0 75 6E 64 61 79 3A 20 20 20 0B 4D 6F 6E 64 61 79 unday:   .Monday
01E0 3A 20 20 20 0C 54 75 65 73 64 61 79 3A 20 20 20 :   .Tuesday:
01F0 0E 57 65 64 6E 65 73 64 61 79 3A 20 20 20 0D 54 .Wednesday:   .T
0200 68 75 72 73 64 61 79 3A 20 20 20 0B 46 72 69 64 hursday:   .Frid
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0290 6D 65 20 2D 20 2D 20 2D 20 05 2C 20 31 39 03 0D me - - - ., 19..
02A0 0A 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
```

Table 1. You can get this program up without an assembler in a pinch by fiddling with this hex dump like we did in the early days. Better yet, get yourself a good macro-assembler like MAC or MACRO-80, both available from Lifeboat Associates. I am discovering that macros are actually more fun than humans should be allowed.

```
                MONTHS
                                    MESSAGE <'January '>          ;Month 1
0223+004A616E75          DB         0,'January '
0223+                    ORG        ?LABLE
0223+09                  DB         ?LENGTH
022C+                    ORG        ?LABLE+?LENGTH
                                    MESSAGE <'February '>         ;Month 2
022C+0046656272          DB         0,'February '
022C+                    ORG        ?LABLE
022C+0A                  DB         ?LENGTH
0236+                    ORG        ?LABLE+?LENGTH
                                    MESSAGE <'March '>            ;Month 3
0236+004D617263          DB         0,'March '
0236+                    ORG        ?LABLE
0236+07                  DB         ?LENGTH
023D+                    ORG        ?LABLE+?LENGTH
                                    MESSAGE <'April '>            ;   .
023D+0041707269          DB         0,'April '
023D+                    ORG        ?LABLE
023D+07                  DB         ?LENGTH
0244+                    ORG        ?LABLE+?LENGTH
                                    MESSAGE <'May '>              ;   .
0244+004D617920          DB         0,'May '
0244+                    ORG        ?LABLE
0244+05                  DB         ?LENGTH
0249+                    ORG        ?LABLE+?LENGTH
```

Table 2. This portion of the TIME/PRN file generated by a macro-assembler shows the code which the macro MESSAGE generates. Notice that it writes the string into memory with a leading zero, computes the length of the string including the length byte and then backs up to write the length into the spot originally occupied by the leading zero. It is a nice time-saver for building extensive tables. This particular macro is from Tim Leslie's Monster Macros. It is about the simplest one in the library.

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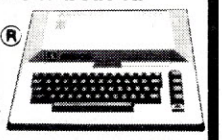
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board directly into my CP/M system. You might note that the assembly-language program has no provisions for setting the time. The work required to implement setting of time and date in assembly didn't seem to be justified by the benefit. Since I made the final adjustment of the trim capacitor for tweaking the clock rate, I have not reset the time at all. The little bit of effort required to load Basic and set the time as a separate operation is inconsequential considering how infrequently it must be done. I have mine adjusted to about +/−15 seconds a month, which is certainly close enough for me.

The program listing is source only, so it does not have the hex column. I did this because the TIME.PRN file is very long and difficult to follow due to the macro expansions. There is a hex dump in Table 1 if you want to fiddle with getting the program up without an assembler.

I have tried to give all the information which might be needed to implement the assembler program on different 8080-like systems. An example of the output appears in Photo 3. If you have a CP/M system you can put this program in your CBIOS, so that whenever you do a warm boot (control-C), you get the time and date automatically.

A few more words about the macro which appears in the program. These can be confusing when you are just beginning to work with them, as I am. Table 2 shows how an assembled file appears when the macro is used to build the tables. As you can see, it is the beginning section of the MONTHS table. Note the line with the beginning address of 0223. The code which follows is what the first line of the macro generates, which is just what you'd expect from the DB op code with the first byte being zero. On the third line down, the length appears, having been computed by the macro, and is replaced over the original zero first byte. The next line clearly shows that the macro then leapfrogs over the data it just inserted to the byte following (022C).

I'd like to present you with a little puzzle concerning the program. There is a section of the program in which I have written some code which does more than is actually needed to obtain the correct numeric value. I'll give you a hint which you probably do not need. How many possibilities are there for expressing the tens column of the month of the year? There is a simpler way to obtain the binary value representing the month, although I don't think it would save more than a couple of bytes. I didn't think of it until the program was finished and it's more interesting to present it to you as it is. I'll send a small sample of Papua New Guinea stamps, coins and currency to the three people who present me with the most elegant (whatever that is) solution to the puzzle.

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Conclusion

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Program listing.

```
;================ begin listing  "TIME.ASM" ==========================================
;
;       ***************************************************************************
;       *                                                                         *
;       *    Program to access QT+ Clock/Calendar board, January 8, 1981          *
;       *         Jan Messersmith, Pioneer Bible Translators, Inc.                *
;       *              P. O. Box 178, Madang, Papua/New Guinea                    *
;       *                                                                         *
;       *                                                                         *
;       *                                                                         *
;       *                                                                         *
;       *                                                                         *
;       ***************************************************************************
;
```

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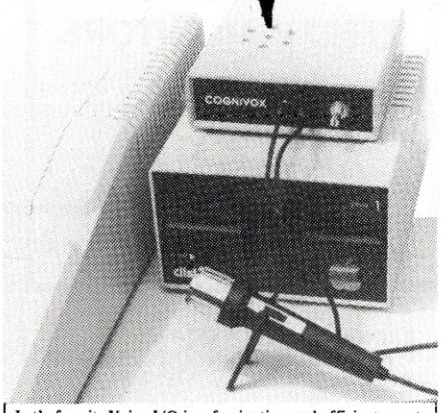
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Listing continued.

```
;
;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
;
;                       PROGRAM PURPOSE AND FUNCTION
;
;       This program will access and display the time, date and day of week
;       from the QT+ Clock/Calendar S-100 board (revision A).  It is designed
;       for operation, as it is written, as a stand-alone CP/M program.  When
;       assembled and loaded, it is invoked by typing TIME(CR).
;
;       The appearance of the output at the console device is:
;
;       Sunday:   December 23, 1984        time - - - 23:59:45
;
;+++++++++++++++++++++++++
;
;       The program functions as follows:
;
;    1. After initializing the ports and addresses used and setting the point
;       for beginning code generation, the stack pointer is loaded and a
;       command is sent to the clock board to "hold" the present information
;       in the registers.  This is done to prevent any change of register data
;       while they are being accessed.  For instance, having read a 4 for
;       minute tens, while processing this the minute units passes from 9 to
;       0.  The printed time will be 40 instead of the correct 50.  The
;       use of the hold command will preclude this possibility.  Note that
;       the hold line should not be held active for more than one second.
;
;    2. The next step is a 150 uSecond delay to allow the data to settle in the
;       registers.  The immediate value for the compare instruction can be
;       changed to optimize for cycle times other than 500 nSeconds (2 MHZ).
;
;    3. Next, the day of the week is obtained from register 6 and is converted
;       to a day name by accessing the DAYS table.  This string is printed on
;       the console device.
;
;    4. The month tens is obtained from register 10 and is multiplied by ten.
;       The month units is then added to it, yielding a binary value which
;       acts as an entry number into the MONTHS table.  The string is
;       obtained from the table and printed.
;
;    5. The date tens is obtained from register 8 and is stripped of the leap
;       year bit.  It is checked to see is it is a leading zero and skipped if
;       it is.  The date units is obtained from register 7 and printed.
;
;    6. The year printing is preceded by a literal string of ", 19".  The year
;       tens and units are obtained from registers 12 and 11 respectively and
;       are printed.
;
;    7. The time printing is preceded by a literal string of "    time - - - ".
;       Hour tens and hour units are obtained from registers 5 and 4, the
;       AM/PM and 12/24 bits are stripped from the hour tens and the digits are
;       printed along with a following colon.
;
;    8. Minutes and seconds are handled in the same manner as are the hours
;       except that there are no extra bits to strip and the seconds are
;       followed by a carriage return/line feed pair instead of a colon.
;
;    9. Finally, the hold line is released followed by a jump to a CP/M
;       warm boot.
;
;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
;
;       ************************
;       *  Notes about CONOUT  *
;       ************************
;
;       The CONOUT routine for the program as written must have the form:
;
;       CONOUT  IN              STATUSPORT
;               ANI             SOMETHING
;               JZ (or JNZ)     CONOUT
;               MOV             A,C
;               OUT             DATAPORT
;               RET
;
;       or a functional equivalent.  Of course, The routine can be inserted in
;       the program instead of calling an external subroutine.  In this case,
;       the CONOUT routine must be added to the code and the EQUate for CONOUT
;       at the beginning of the program sould be removed.
;
;+++++++++++++++++++++++++++++++++++
;
;       ************************************************************
;       *  Notes about manual table construction (no macro used).  *
;       ************************************************************
;
;       The macro used is interesting in its operation and a time saver for
;       large tables,  If no macro-assembler is available, use a simple manual
;       method following this form.  (It is, of course, identical to the code
;       which the macro generates.)  The example will be the DAYS table from
;       the program.
;
;       DAYS                                        ;Name of table.
;               DB      11,'Sunday:   '             ;Note that the first byte is
;               DB      11,'Monday:   '             ;the length of the string
;               DB      12,'Tuesday:    '           ;plus the length byte.
;               DB      14,'Wednesday:  '
;               DB      13,'Thursday:   '
;               DB      11,'Friday:   '
;               DB      13,'Saturday:   '
;
;+++++++++++++++++++++++++++++++++++
```

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Listing continued.

```
;
;       ************************************************
;       *  Notes about use with other operating systems  *
;       ************************************************
;
;       This program should run, with minor changes, on just about any 8080,
;       8085 or Z80 based machine.  The only areas which will need some
;       attention are the ORG address, the I/O port addressing for your
;       system and some particulars concerning CONOUT.
;
;       For instance, with a North Star system, the program could be assembled
;       at a convenient address so that GO TIME could be typed in DOS and
;       loading and execution of the program would proceed.  In this case, the
;       line reading "CPM EQU 0" should be changed to read "DOS EQU 02028H" (or
;       the valid DOS warm entry address).  The line "JMP CPM" should then be
;       "JMP DOS".  Finally, the CONOUT EQUate should be changed to match CHOUT
;       in DOS and all the places where the program passes the character to be
;       printed to CONOUT in register C must be changed to pass the character in
;       register B to conform with DOS convention.  Two last things to remember
;       about DOS are that the device number for CHOUT is passed to it in A and
;       the printed character must also be in A on RETurn.  (Be sure A contains
;       a 0 when calling CHOUT or your character will go somewhere other than
;       the console.)  I do not know of any macro-assemblers available for the
;       North Star system, so table construction will probably be manual.
;
;       I suspect that modification for other systems will entail the same sort
;       of attention to I/O and addresses as the source is entered.
;
;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
;  begin program  begin program  begin program  begin program  begin program
;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
;
;       ******************
;       *  Initialize.   *
;       ******************
;
                ORG     0100H           ;Locate in CP/M TPA for auto run.
CONOUT          EQU     0FDF1H          ;Sends ASCII character to console.
CPM             EQU     0               ;CP/M warm boot address.
MODE            EQU     189             ;(port addressed by switch S-1) + 1
CLOCK           EQU     190             ;(port addressed by switch S-1) + 2
;
;       ************************************************************
;       *  Load stack pointer and prepare clock for read operation.  *
;       ************************************************************
;
;
                LXI     SP,FINIS+10     ;Set stack pointer ten bytes from end.
                MVI     A,16            ;Put "hold" command in A.
                OUT     MODE            ;Raise "hold" line.
;
;       ****************************
;       *  Settling time delay.    *
;       ****************************
;
;
                MOV     A,A             ;Begin 150 uSecond delay before a read
                XRA     A               ;operation.
STALL           INR     A
                CPI     13              ;This is for 2 MHZ.
                JNZ     STALL           ;End of delay.
;
;       ****************************
;       *  Handle day of week.     *
;       ****************************
;
;
                MVI     A,38            ;Request day of week.
                CALL    GETNUMBER       ;On RETurn, A contains pointer to
                                        ;proper entry in table.
                LXI     H,DAYS          ;Point HL to address of DAYS.
                CALL    SENDIT0         ;Print proper day name.
;
;       **********************
;       *  Handle Month.     *
;       **********************
;
;
                MVI     A,42            ;Request month tens.
                CALL    GETNUMBER       ;Bring it into A.
                RLC                     ;Multiply by 2.
                PUSH    PSW             ;Save the X2 results for later.
                RLC                     ;Multiply by 2 again (X4).
                RLC                     ;Once more (X8).
                POP     B               ;Bring back the X2 into BC.
                ADD     B               ;Add B (flags are in C).  Now A has the
                                        ;original value X10.
                PUSH    PSW             ;Save it on stack.
                MVI     A,41            ;Request month units.
                CALL    GETNUMBER       ;Bring it into A.
                POP     B               ;Bring back tens value into BC (B).
                ADD     B               ;Add it to units in A.
                LXI     H,MONTHS        ;Point HL to MONTHS table (A is
                CALL    SENDIT1         ;pointing to month name).  Print it.
;
;       ********************
;       *  Handle Date.    *
;       ********************
;
;
                MVI     A,40            ;Request date tens.
                CALL    GETNUMBER       ;Bring it into A.
                ANI     3               ;Get rid of "Leap Year" bit (Actually,
                                        ;mask out all but the 2 LSBs).
                CPI     0               ;See it it's a leading zero.
                JZ      SKIPIT          ;If it is, skip over it.
                CALL    SENDNUMBER      ;If it's not a zero, print it.
SKIPIT          MVI     A,39            ;Request date units.
```

More →

Listing continued.

```
                CALL    PRINTDIGIT      ;Get it from clock, make it ASCII and
                                        ;print it.
;       ********************
;       *  Handle Year.    *
;       ********************
;
                MVI     A,1             ;Set the table entry pointer to 1.
                LXI     H,YBLURB        ;Point HL to ", 19".
                CALL    SENDIT1         ;Print at console.
                MVI     A,44            ;Request year tens.
                CALL    PRINTDIGIT      ;Get it, make ASCII and print it.
                MVI     A,43            ;Request year units.
                CALL    PRINTDIGIT      ;Get it, make ASCII and print it.
;
;       ********************
;       *  Handle time.    *
;       ********************
;
                MVI     A,1             ;Set the table entry pointer to 1.
                LXI     H,TBLURB        ;Point HL to "          time - - - ".
                CALL    SENDIT1         ;Print at console.
;       HOURS
                MVI     A,37            ;Request hour tens.
                CALL    GETNUMBER       ;Bring it into A.
                ANI     3               ;Get rid of AM/PM & 12/24 bits.
                CALL    SENDNUMBER      ;Make it ASCII and print it.
                MVI     A,36            ;Request hour units.
                CALL    PRINTDIGIT      ;Get it, make ASCII and print it.
                MVI     C,':'           ;Need a colon here; pass it to CONOUT
                CALL    CONOUT          ;in C as per standard CP/M practice.
;       MINUTES
                MVI     A,35            ;Request minute tens.
                CALL    PRINTDIGIT      ;Get it, make ASCII and print it.
                MVI     A,34            ;Request minute units.
                CALL    PRINTDIGIT      ;Get it, make ASCII and print it.
                MVI     C,':'           ;Do the colon thing again.
                CALL    CONOUT
;       SECONDS
                MVI     A,33            ;Request second tens.
                CALL    PRINTDIGIT      ;Get it, make ASCII and print it.
                MVI     A,32            ;Request second units.
                CALL    PRINTDIGIT      ;Get it, make ASCII and print it.
                                        ;
                MVI     A,1             ;Set the table entry pointer at 1.
                LXI     H,CRLF          ;Point HL at CRLF.
                CALL    SENDIT1         ;Print it at console.
;
;       ************************************
;       *  Release board from "hold" mode.  *
;       ************************************
;
                XRA     A               ;Zero is code for "release hold".
                OUT     MODE            ;Do it.
                JMP     CPM             ;All done, do a warm boot.
;
;++++++++++++++++++++++++++++++++++++++
; subroutine section   subroutine section
;++++++++++++++++++++++++++++++++++++++
;
PRINTDIGIT
                CALL    GETNUMBER       ;Get number requested by A from clock.
                CALL    SENDNUMBER      ;Make it ASCII and print it.
                RET
GETNUMBER
                OUT     CLOCK           ;Send register request to clock.
                JMP     $+3             ;Kill some time (at least 6 uSecond).
                JMP     $+3             ;This ought to do it (10 uSec @ 2 MHZ).
                IN      CLOCK           ;Receive requested data in A.
                RET
SENDNUMBER
                ORI     '0'             ;Add an ASCII '0' to the binary to make
                MOV     C,A             ;it printable and move it to C.  See
                CALL    CONOUT          ;comments at beginning of program
                RET                     ;concerning CONOUT.
;
;       ****************************
;       *  Accessing the tables.   *
;       ****************************
;
;       "Entry number" or "entry" means the binary number representing the
;       relative position of the stirng which is being selected from a
;       particular table.  This is passed in A.  Register pair HL must contain
;       a the address of the table which contains the entry. (HL selects table,
;       A selects entry.)
;
SENDIT0         INR     A               ;Enter here if entries begin at zero.
SENDIT1         DCR     A               ;Enter here if entries begin at one.
                JZ      DONE            ;When A DCRs down to 0, the "inchworm"
                                        ;has found the requested table entry.
;
;       At this point, HL points to the first byte of an entry.  This byte
;       contains the length of the entry including the length (first) byte.
;
                MOV     E,M             ;Move the length of the entry to E.
                MVI     D,0             ;Clear out D so that DE=length.
                DAD     D               ;Add the length to the current address
                                        ;contained in HL.
                JMP     SENDIT1         ;Go back to check A to see if correct
                                        ;entry has been found.
;
;       At DONE, HL points to the first byte of the selected entry.  This byte
;       contains the length of that entry.  The length is now moved to A.
;
```

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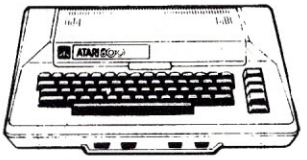
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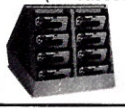
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Listing continued.

```
DONE            MOV     A,M
TOCONSOLE       INX     H               ;Bump pointer to next (or the first)
                                        ;byte of actual message.
                DCR     A               ;Subtract 1 from remaining length to
                                        ;see if entire message has been sent.
                RZ                      ;Return if it has.
                MOV     C,M             ;If not, move the next character to C.
                PUSH    PSW             ;Save the remaining length value.
                CALL    CONOUT          ;Print the character.
                POP     PSW             ;Get the remaining length back in A.
                JMP     TOCONSOLE       ;Keep going 'till it's all printed.
;
;+++++++++++++++++++++++++++++++++++++
;     data section     data section
;+++++++++++++++++++++++++++++++++++++
;
;       *********************
;       *   Build tables.   *
;       *********************
;
;       These tables were built by a macro which generates tables.  If no macro
;       assembler is available, the tables can be constructed according to the
;       note at the beginning of this program.
;
;       The following macro generates tables with the form:
;
;       LABLE   STRING LENGTH+1,'STRING'        ;Each defined as an "entry".
;               STRING LENGTH+1,'STRING'
;               STRING LENGTH+1,'STRING'
;               .
;               .
;               .  etc.
;
;       It is invoked by the form:
;
;       LABLE   MESSAGE <'STRING'>      ;Where LABLE is the name of the table
;               MESSAGE <'STRING'>      ;and each line (invocation of the
;               MESSAGE <'STRING'>      ;macro) is an "entry" in the table.
;               .
;               .
;               .  etc.
;
;       This macro courtesy of Tim Leslie (tcl software).
;
MESSAGE         MACRO   ?STRING         ;Define a macro called MESSAGE with one
                                        ;parameter of ?STRING.
?LABLE          SET     $               ;Set value of ?LABLE = current address.
                DB      0,?STRING       ;Define the form of the entry and place
                                        ;the parameter (STRING) in position
                                        ;in the code.
?LENGTH         SET     $-?LABLE        ;Set the value of ?LENGTH = current
                                        ;address - original address.
                ORG     ?LABLE          ;Begin next code generation at
                                        ;?LABLE (where the 0 is stored).
                DB      ?LENGTH         ;Generate (write over) the length byte.
                ORG     ?LABLE+?LENGTH  ;Begin next code generation at next
                                        ;byte after the end of STRING.
                ENDM                    ;End the macro definition.
;
;       *******************************
;       *   Table code begins here.   *
;       *******************************
;
DAYS
                MESSAGE <'Sunday:    '>         ;Day 0
                MESSAGE <'Monday:    '>         ;Day 1
                MESSAGE <'Tuesday:   '>         ;Day 2
                MESSAGE <'Wednesday:   '>       ;  .
                MESSAGE <'Thursday:  '>         ;  .   etc.
                MESSAGE <'Friday:    '>
                MESSAGE <'Saturday:  '>         ;Day 6
MONTHS
                MESSAGE <'January '>            ;Month 1
                MESSAGE <'February '>           ;Month 2
                MESSAGE <'March '>              ;Month 3
                MESSAGE <'April '>              ;  .
                MESSAGE <'May '>                ;  .
                MESSAGE <'June '>               ;  .   etc.
                MESSAGE <'July '>
                MESSAGE <'August '>
                MESSAGE <'September '>
                MESSAGE <'October '>
                MESSAGE <'November '>
                MESSAGE <'December '>           ;Month 12
TBLURB
                MESSAGE <'       time - - - '>
YBLURB
                MESSAGE <', 19'>
CRLF
                DB      3,0DH,0AH
FINIS
;
;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
;  end program     end program     end program     end program     end program
;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
;
;
;=============  end listing  "TIME.ASM"  ==========================================
;
                END

A>
```

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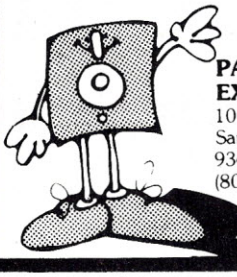
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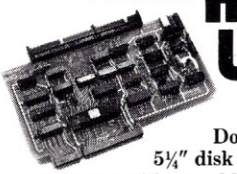
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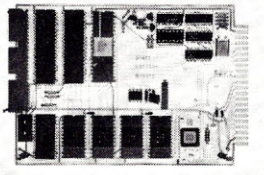
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Here's a pluperfect way to conjugate Latin verbs and form verb synopses using string manipulation.

Computo, Computas, Computat

By David Lippmann

As a student of Latin for four years, I've developed a great appreciation for the regularity of the Latin language. To be sure, 99 percent of all Latin verbs follow specific patterns; i.e., they fall into five major groups or conjugations. For this reason, I was particularly enthusiastic about writing a computer program to conjugate verbs.

Upon input, the program will conjugate any regular, deponent, semideponent or defective verb in the Latin language. Regular verbs have four principal parts and fall into one of five conjugations. Deponent verbs are passive in form, but active in meaning. Semideponent verbs form the perfect system of tenses only as deponents. Defective verbs are lacking in third or fourth principal parts.

The six tenses are formed by the addition of the personal endings (located in the data lines) to the various stems (determined from the four inputs). Each tense of the Latin verb is printed out (present, imperfect, future, perfect, pluperfect, future perfect), as well as the infinitives, participles and imperatives.

This program is written in MOS Tech 6502 Basic V1.1, but it will work successfully on any microcomputer implementing the LEFT$ and RIGHT$ string functions. The terminal width is determined in line 350, but may be redefined as any multiple of four to accommodate a variety of terminals. ■

Sample run.

```
RUN
WOULD YOU LIKE DIRECTIONS? YES

THIS PROGRAM WILL CONJUGATE ANY REGULAR, DEPONENT,
SEMIDEPONENT OR DEFECTIVE VERB IN THE LATIN LANGUAGE.
IRREGULAR VERBS WILL NOT BE CONJUGATED.

(1) ENTER THE FOUR PRINCIPLE PARTS SEPARATED BY
    COMMAS.  WHERE PARTS ARE MISSING, PLACE TWO
    CONSECUTIVE COMMAS.  EMPLOY A LOWER CASE 'E'
    IN SECOND CONJUGATION VERBS TO DENOTE A LONG
    VOWEL SOUND.

(2) ENTER THE PERSON AS A TWO-CHARACTER STRING.
    THE FIRST CHARACTER REPRESENTS THE PERSON
    (1,2,3), THE SECOND CHARACTER REPRESENTS THE
    NUMBER (S=SINGULAR, P=PLURAL).  DEFAULT THE
    PERSON INQUIRY TO CONJUGATE EACH PERSON (ENTER
    BLANK SPACE AND CARRIAGE RETURN).

VERB? TOLLO,TOLLERE,SUSTULI,SUBLATUS
PERSON?

          INDICATIVE                          SUBJUNCTIVE

ACTIVE          PASSIVE          ACTIVE          PASSIVE

                                 PRESENT

TOLLO           TOLLOR           TOLLAM          TOLLAR
TOLLIS          TOLLERIS         TOLLAS          TOLLARIS
TOLLIT          TOLLITUR         TOLLAT          TOLLATUR
TOLLIMUS        TOLLIMUR         TOLLAMUS        TOLLAMUR
TOLLITIS        TOLLIMINI        TOLLATIS        TOLLAMINI
TOLLUNT         TOLLUNTUR        TOLLANT         TOLLANTUR

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TOLLEBAMUS      TOLLEBAMUR       TOLLEREMUS      TOLLEREMUR
TOLLEBATIS      TOLLEBAMINI      TOLLERETIS      TOLLEREMINI
TOLLEBANT       TOLLEBANTUR      TOLLERENT       TOLLERENTUR

                                 FUTURE

TOLLAM          TOLLAR
TOLLES          TOLLeRIS
```

More →

David Lippmann (21 Old Forge Lane, Tarrytown, NY 10591) is a student at Irvington High School, New York.

Sample run continued.

```
TOLLET          TOLLETUR
TOLLEMUS        TOLLEMUR
TOLLETIS        TOLLEMINI
TOLLENT         TOLLENTUR

                        PERFECT

SUSTULI         SUBLATUS SUM    SUSTULERIM      SUBLATUS SIM
SUSTULISTI      SUBLATUS ES     SUSTULERIS      SUBLATUS SIS
SUSTULIT        SUBLATUS EST    SUSTULERIT      SUBLATUS SIT
SUSTULIMUS      SUBLATI SUMUS   SUSTULERIMUS    SUBLATI SIMUS
SUSTULISTIS     SUBLATI ESTIS   SUSTULERITIS    SUBLATI SITIS
SUSTULERUNT     SUBLATI SUNT    SUSTULERINT     SUBLATI SINT
RUN
WOULD YOU LIKE DIRECTIONS? NO
VERB? TOLLO,TOLLERE,SUSTULI,SUBLATUS
PERSON? 3S

        INDICATIVE                      SUBJUNCTIVE

ACTIVE          PASSIVE         ACTIVE          PASSIVE

TOLLIT          - TOLLITUR      TOLLAT          - TOLLATUR
TOLLEBAT        - TOLLEBATUR    TOLLERET        - TOLLERETUR
TOLLET          - TOLLETUR                      -
-------------------------------------------------------------
SUSTULIT        - SUBLATUS EST  SUSTULERIT      - SUBLATUS SIT
SUSTULERAT      - SUBLATUS ERAT SUSTULISSET     - SUBLATUS ESSET
SUSTULERIT      - SUBLATUS ERIT                 -

                INFINITIVES             PARTICIPLES

PRESENT ACTIVE      TOLLERE             TOLLENS
PRESENT PASSIVE     TOLLI
PERFECT ACTIVE      SUSTULISSE
PERFECT PASSIVE     SUBLATUS ESSE       SUBLATUS
FUTURE ACTIVE       SUBLATURUS ESSE     SUBLATURUS
FUTURE PASSIVE      SUBLATUM IRI        TOLLENDUS

                (POSITIVE)      IMPERATIVES     (NEGATIVE)

ACTIVE          TOLLE                           NOLI TOLLERE
ACTIVE          TOLLITE                         NOLITE TOLLERE
PASSIVE         TOLLERE                         NOLI TOLLI
PASSIVE         TOLLIMINI                       NOLITE TOLLI

                        PLUPERFECT

SUSTULERAM      SUBLATUS ERAM   SUSTULISSEM     SUBLATUS ESSEM
SUSTULERAS      SUBLATUS ERAS   SUSTULISSES     SUBLATUS ESSES
SUSTULERAT      SUBLATUS ERAT   SUSTULISSET     SUBLATUS ESSET
SUSTULERAMUS    SUBLATI ERAMUS  SUSTULISSEMUS   SUBLATI ESSEMUS
SUSTULERATIS    SUBLATI ERATIS  SUSTULISSETIS   SUBLATI ESSETIS
SUSTULERANT     SUBLATI ERANT   SUSTULISSENT    SUBLATI ESSENT

                        FUTURE PERFECT

SUSTULERO       SUBLATUS ERO
SUSTULERIS      SUBLATUS ERIS
SUSTULERIT      SUBLATUS ERIT
SUSTULERIMUS    SUBLATI ERIMUS
SUSTULERITIS    SUBLATI ERITIS
SUSTULERINT     SUBLATI ERUNT

                INFINITIVES             PARTICIPLES

PRESENT ACTIVE      TOLLERE             TOLLENS
PRESENT PASSIVE     TOLLI
PERFECT ACTIVE      SUSTULISSE
PERFECT PASSIVE     SUBLATUS ESSE       SUBLATUS
FUTURE ACTIVE       SUBLATURUS ESSE     SUBLATURUS
FUTURE PASSIVE      SUBLATUM IRI        TOLLENDUS

                (POSITIVE)      IMPERATIVES     (NEGATIVE)

ACTIVE          TOLLE                           NOLI TOLLERE
ACTIVE          TOLLITE                         NOLITE TOLLERE
PASSIVE         TOLLERE                         NOLI TOLLI
PASSIVE         TOLLIMINI                       NOLITE TOLLI
```

Program listing. Latin verb conjugation program in MOS Tech Basic.

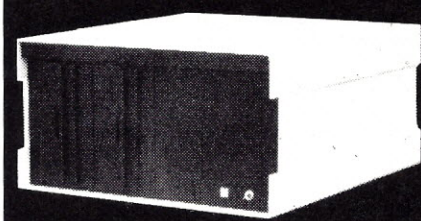
```
100 REM LATIN CONJUGATION
110 REM 1981- DAVID LIPPMANN- IRVINGTON HIGH SCHOOL
115 REM IRVINGTON, NEW YORK  10533
120 INPUT"WOULD YOU LIKE DIRECTIONS";I$:IFLEFT$(I$,1)="N"THEN200
130 PRINT
131 PRINT"THIS PROGRAM WILL CONJUGATE ANY REGULAR, DEPONENT,    "
132 PRINT"SEMIDEPONENT OR DEFECTIVE VERB IN THE LATIN LANGUAGE."
133 PRINT"IRREGULAR VERBS WILL NOT BE CONJUGATED,               "
```

More

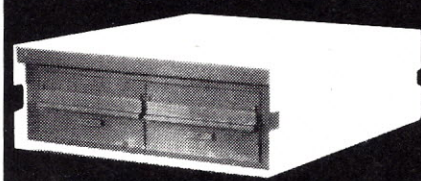
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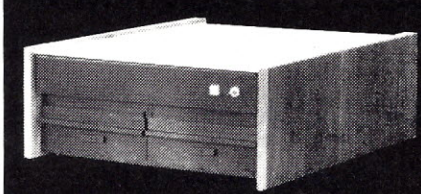
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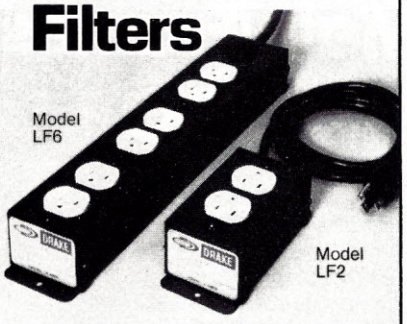
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Listing continued.

```
134 PRINT
135 PRINT"(1) ENTER THE FOUR PRINCIPLE PARTS SEPARATED BY       "
136 PRINT"    COMMAS.  WHERE PARTS ARE MISSING, PLACE TWO       "
137 PRINT"    CONSECUTIVE COMMAS.  EMPLOY A LOWER CASE 'E'      "
138 PRINT"    IN SECOND CONJUGATION VERBS TO DENOTE A LONG      "
139 PRINT"    VOWEL SOUND.                                      "
140 PRINT
141 PRINT"(2) ENTER THE PERSON AS A TWO-CHARACTER STRING.       "
142 PRINT"    THE FIRST CHARACTER REPRESENTS THE PERSON         "
143 PRINT"    (1,2,3), THE SECOND CHARACTER REPRESENTS THE      "
144 PRINT"    NUMBER (S=SINGULAR, P=PLURAL).  DEFAULT THE       "
145 PRINT"    PERSON INQUIRY TO CONJUGATE EACH PERSON (ENTER    "
146 PRINT"    BLANK SPACE AND CARRIAGE RETURN).                 "
147 PRINT
200 INPUT"VERB";P1$,P2$,P3$,P4$
210 E$=RIGHT$(P2$,3)
220 IFRIGHT$(P2$,1)="I"THEND=1:P1$=LEFT$(P1$,LEN(P1$)-1)
230 IFE$="ERE"ORD=1THENC=3
240 IFC=3ANDRIGHT$(P1$,2)="IO"THENC=5
250 IFE$="ARE"ORE$="ARI"THENC=1
260 IFE$="eRE"ORE$="eRI"THENC=2
270 IFE$="IRE"ORE$="IRI"THENC=4
280 IFD=1THENP2$=LEFT$(P2$,LEN(P2$)-1)+"E"
290 IFD=1AND(C=3ORC=5)THENP2$=P2$+"RE"
295 IFC=0THENPRINT"VERB IS IRREGULAR":GOTO200
300 IFP3$=""THENF3=1:P3$="--------"
310 IFP4$=""THENF4=1:P4$="--------"
315 IFRIGHT$(P4$,3)="SUM"THENP4$=LEFT$(P4$,LEN(P4$)-4)
320 IF RIGHT$(P4$,4)="URUS"THENP4$=LEFT$(P4$,LEN(P4$)-4)+"US"
330 INPUT"PERSON";I$:N=0
335 IFRIGHT$(I$,1)="P"THENN=3
340 P=N+VAL(LEFT$(I$,1))
350 T=72:DIMM$(14,6)
360 FORR=1TO14:FOR CL=1TO6
370 READ M$(R,CL)
380 NEXTCL:NEXTR
400 REM INDICATIVE AND SUBJUNCTIVE
410 IN$="INDICATIVE":SB$="SUBJUNCTIVE":AC$="ACTIVE":PA$="PASSIVE"
420 PRINT:PRINTTAB(.125*T)IN$;TAB(.625*T)SB$:PRINT
430 PRINTAC$;TAB(.25*T)PA$;TAB(.5*T)AC$;TAB(.75*T)PA$
440 IFP<>0THEN480
450 FORK=1TO6:FORCL=1TO6:GOSUB2000
460 PRINTA1$;TAB(.25*T)B1$;TAB(.5*T)A2$;TAB(.75*T)B2$
470 NEXTCL:NEXTK:GOTO550
480 CL=P:PRINT:FORK=1TO6:GOSUB2000
490 PRINTA1$;TAB(.25*T)"- ";B1$;TAB(.5*T)A2$;TAB(.75*T)"- ";B2$
500 IFK<>3THEN520
510 FORJ=1TOT:PRINT"-";:NEXTJ:PRINT
520 NEXT K
550 REM INFINITIVES AND PARTICIPLES
560 PRINT:PRINTTAB(.25*T+4)"INFINITIVES";TAB(.75*T-4)"PARTICIPLES"
565 PRINT
570 W$="PRESENT":A1$=P2$:B1$=LEFT$(P2$,LEN(P2$)-1)+"I"
580 IFC=3ORC=5THENB1$=FS$+"I"
590 PI$=B1$:A2$=S$+"NS"
600 IFC=4THENA2$=S$+"ENS"
610 IFC=5THENA2$=FS$+"IENS"
620 PP$=A2$:B2$="":GOSUB2100
630 W$="PERFECT":A1$=P3$+"SSE":B1$=P4$+" ESSE"
640 A2$="":B2$=P4$:GOSUB2100
650 W$="FUTURE":P6$=LEFT$(P4$,LEN(P4$)-2)
660 A1$=P6$+"URUS ESSE":B1$=P6$+"UM IRI"
670 A2$=P6$+"URUS":B2$=LEFT$(PP$,LEN(PP$)-1)+"BUS":GOSUB2100
700 REM IMPERATIVES
710 PRINT:PRINTTAB(.25*T)"(POSITIVE)";TAB(.5*T)"IMPERATIVES";
715 PRINTTAB(.75*T)"(NEGATIVE)":PRINT
720 A1$=S$:A2$="NOLI "+P2$:GOSUB2200
730 A1$=S$+"TE":IFC=3ORC=5THENA1$=F$+"ITE"
740 A2$="NOLITE "+P2$:GOSUB2200
750 B1$=P2$:B2$="NOLI "+PI$:GOSUB2250
760 R=C+2:IFC=5THENR=6
770 B1$=FS$+LEFT$(M$(R,4),1)+"MINI":B2$="NOLITE "+PI$:GOSUB2250
800 END
1000 ONKGOTO1100,1200,1300,1400,1500,1600
1100 W$="PRESENT"
1110 S$=LEFT$(P2$,LEN(P2$)-2):FS$=LEFT$(P2$,LEN(P2$)-3)
1120 R=C+2:IFC=5THENR=6
1130 A1$=FS$+M$(R,CL):B1$=LEFT$(A1$,LEN(A1$)-LEN(X$))+Y$
1140 IFCL=1THENB1$=A1$+Y$
1150 IFCL=2AND(C=3ORC=5)THENB1$=S$+Y$
1160 GOSUB2300:RETURN
1200 W$="IMPERFECT"
1210 IS$=S$:IFC=4ORC=5THENIS$=FS$+"IE"
1220 A1$=IS$+"BA"+X$:B1$=IS$+"BA"+Y$
1230 A2$=P2$+X$:B2$=P2$+Y$:RETURN
1300 W$="FUTURE"
1310 R=7:F$=S$:IFC>2THENR=9:F$=FS$
1315 IFC=4ORC=5THENF$=FS$+"I"
1320 A1$=F$+M$(R,CL):B1$=F$+M$(R+1,CL)
1330 A2$="":B2$="":RETURN
1400 W$="PERFECT"
1410 PS$=LEFT$(P3$,LEN(P3$)-1):R=11
1420 A1$=PS$+M$(R,CL):B1$=P5$+" "+M$(R+2,CL)
1430 A2$=PS$+"ERI"+X$:B2$=P5$+" STI"+X$:RETURN
1500 W$="PLUPERFECT"
1510 A1$=PS$+"ERA"+X$:B1$=P5$+" ERA"+X$
1520 A2$=P3$+"SSE"+X$:B2$=P5$+" ESSE"+X$:RETURN
```

More →

Listing continued.

```
1600 W$="FUTURE PERFECT"
1610 R=12:A1$=PS$+M$(R,CL):B1$=P5$+" "+M$(R+2,CL)
1620 A2$="":B2$="":RETURN
2000 X$=M$(1,CL):Y$=M$(2,CL)
2010 P5$=P4$:IFCL>3THENP5$=LEFT$(P4$,LEN(P4$)-2)+"I"
2020 GOSUB 1000
2030 IFD=1THENA1$="":A2$=""
2040 IFF3=1ANDK>3THENA1$="":A2$=""
2050 IFF4=1ANDK>3THENB1$="":B2$=""
2060 IFP=0ANDCL=1THENPRINT:PRINTTAB(.5*T-.5*LEN(W$))W$:PRINT
2070 RETURN
2100 IFD=1ANDW$="PRESENT"THENA1$=""
2110 IFD=1ANDW$="FUTURE"THENB1$=""
2120 IFF3=1ANDW$="PERFECT"THENA1$=""
2130 IFF4=1ANDW$="PERFECT"THENB1$="":B2$=""
2140 IFF4=1ANDW$="FUTURE"THENA1$="":B1$=""
2150 PRINTW$;" ";AC$;TAB(.25*T+4)A1$;TAB(.75*T-4)A2$
2160 PRINTW$;" ";PA$;TAB(.25*T+4)B1$;TAB(.75*T-4)B2$
2165 RETURN
2200 IFD=1THENA1$="":A2$=""
2210 PRINT"ACTIVE";TAB(.25*T)A1$;TAB(.75*T)A2$:RETURN
2250 PRINT"PASSIVE";TAB(.25*T)B1$;TAB(.75*T)B2$:RETURN
2300 REM PRESENT SUBJUNCTIVE
2310 IFC=1THENA2$=FS$+"E"+X$
2320 IFC=3THENA2$=FS$+"A"+X$
2330 IFC=2ORC=4THENA2$=S$+"A"+X$
2340 IFC=5THENA2$=FS$+"IA"+X$
2350 B2$=LEFT$(A2$,LEN(A2$)-LEN(X$))+Y$:RETURN
3000 DATA"M","S","I","MUS","TIS","NT"
3005 DATA"R","RIS","TUR","MUR","MINI","NTUR"
3010 DATA"O","AS","AT","AMUS","ATIS","ANT"
3015 DATA"EO","ES","ET","EMUS","ETIS","ENT"
3020 DATA "O","IS","IT","IMUS","ITIS","UNT"
3025 DATA"IO","IS","IT","IMUS","ITIS","IUNT"
3030 DATA"BO","BIS","BIT","BIMUS","BITIS","BUNT"
3035 DATA"BOR","BERIS","BITUR","BIMUR","BIMINI","BUNTUR"
3040 DATA"AM","ES","ET","EMUS","ETIS","ENT"
3045 DATA"AR","eRIS","ETUR","EMUR","EMINI","ENTUR"
3050 DATA"I","ISTI","IT","IMUS","ISTIS","ERUNT"
3055 DATA"ERO","ERIS","ERIT","ERIMUS","ERITIS","ERINT"
3060 DATA"SUM","ES","EST","SUMUS","ESTIS","SUNT"
3065 DATA"ERO","ERIS","ERIT","ERIMUS","ERITIS","ERUNT"
```


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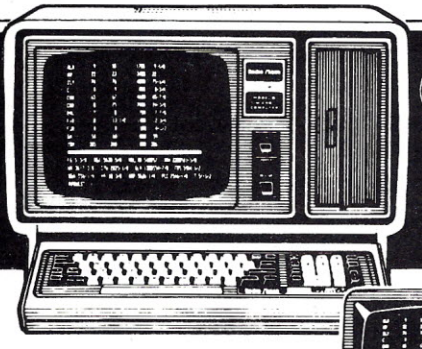
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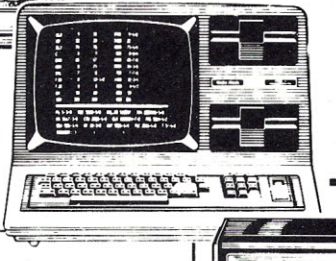
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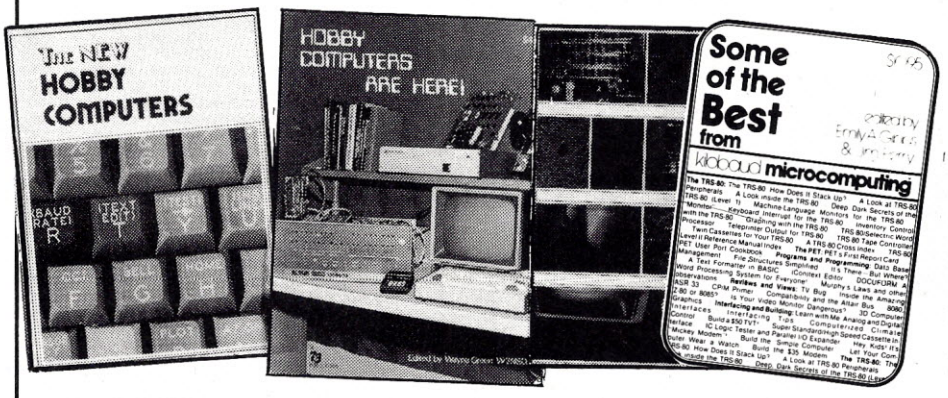
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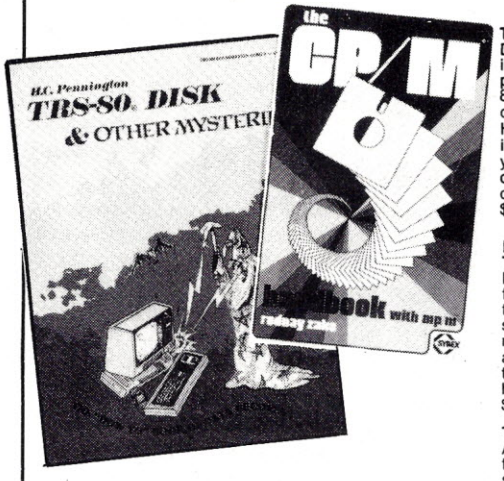
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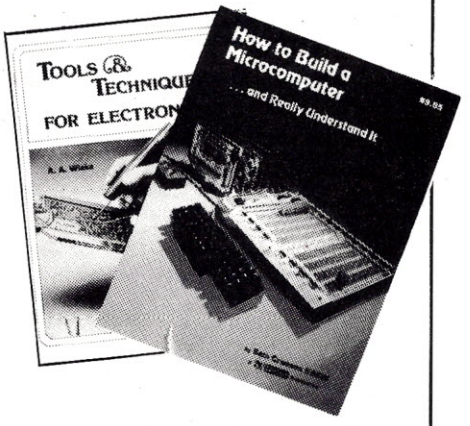
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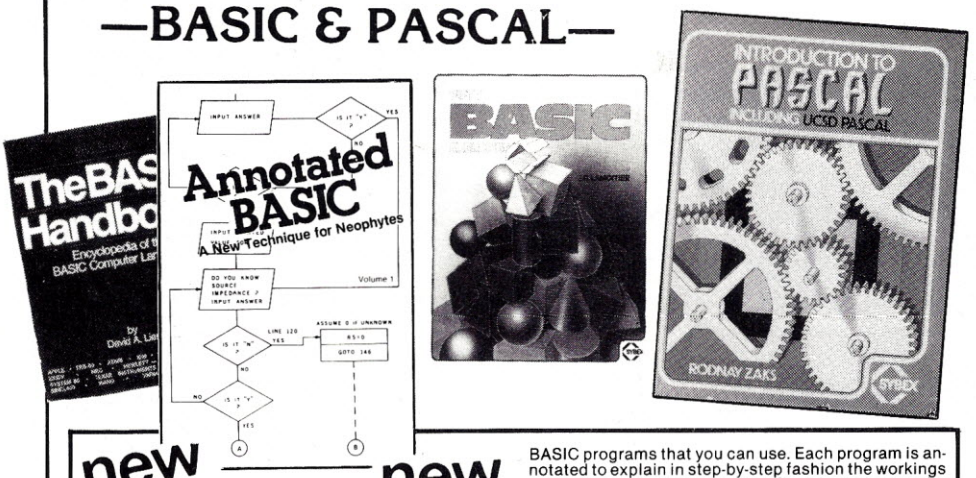
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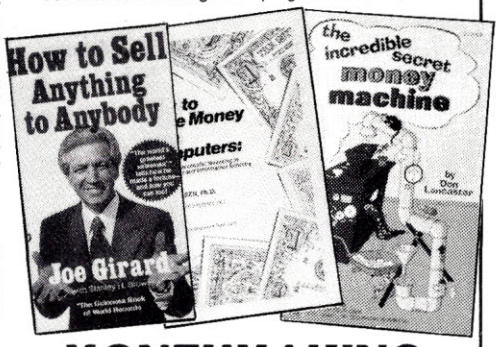
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MC1458P	.55	10/17.70	40 10/3.90
LM720	.30	wirewrap	solder
LM386	1.30		

CPU's

Z-80	7.95
Z-80A CTC	10.50
Z-80A CPU	10.50
Z-80 002 16-64K	129.00
8085A	13.50
2901A	7.50
MC6800	9.50

SPECIALS

ZENITH ZVM-121
Video Monitor / Green !!
12 inch
15 MHz ☆
$ 118.50

8255 → $5.95
8748-8 → $31.00
3341PC → $2.00
MM5060 → 35¢
MC6800 → $7.75
MC6802 – $14.95
MC6850 → $4.50
MC6821 → $4.95

CARDS

MICROSOFT:
Z80 $295.00
16K RAM $160.00
VIDEX:
VIDEOTERM
80 column
$295.00
KEYBOARD ENHANCER
$120.00
CALIF. COMP. SYS:
APPLE CLOCK
$124.00
PROTO BOARD
$25.00

PRINTERS

EPSON:
MX-80 ★15% OFF!
ST: ☆ $535.00
FT: ☆ $645.00

INTERFACE CARD/CABLE
$78.50

QUV-T8/2 by LOGICAL DEV...

"EPROM-Eraser"
·Erase up to 15 EPROM'S in 30min. $69.95
QTY. PRICE AVAIL.

'82' I.C. MASTER

$59.95

SPECIALS

3inch. COMPUTER FANS w/cord → $9.95
2111 → 256×4 Static RAM → $1.75
8155 → RAM, I/O, Timer → $11.50
ER2051 → EAROM → $4.95
8085A → CPU → $8.50
MC6800 → CPU → $7.75
UPD 765A → Floppy Disk Controller → $19.95
2732A → 250ns EPROM → $15.50
AY5 1013A → 30K Band UART → $2.95
93419 → 64×9 Static RAM → $5.50
2901A → 4-Bit Slice → $7.50

4inch FAN "Whisper" w/cord $8.95

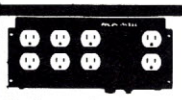
6522 $5.25

REAL-TIME CLOCK CALENDAR (MSM 5832)

Description: Mono Metal Gate CMOS I C

Features
·Time, Month, Date, Year, & Day of Week
·Bus Oriented
·4 Bit Data Bus
·4 Bit Address
·R/W Hold Selec +
·Inter Signal
·32.768Khz xtal Control
·5v Pow Sup
·Low Power Dissipation

$7.45 W/SPEC's
XTAL $2.85



NO Surges or Interference !!
THE MPD 117
turns an ordinary outlet into a controlled power source
$79.50

"GLOBAL" LPK-1:

Logic Probe Kit - complete nothing extra to buy. Min. pulse width 300nsec.
$18.95

DISKETTE SALE!!

"WABASH"

	5¼	8inch	
SS/SD	$25.00	$25.00	Box of 10 pcs
SS/DD	27.40	30.40	
DS/SD	ø	34.90	
DS/DD	32.40	37.40	

QTY. PRICE AVAIL. | CALL FOR PRICE

✓297

COMPUTERS

ATARI® 800™ COMPUTER SYSTEM



400 w/16K $350.00
800 w/16K $699.00
★800 Computer w/48K
★BEST BUY $825.00

ATARI PERIPHERALS:

Printer "825" – 650.00
Disk Dr. "810" – 485.00
Record. "410" – 82.00
Paddle (pr.) / Joystick (pr.) 16.95
32k RAM – 179.95
Basic Cart. – 49.00
Asteroids / Missle Com. 32.50 / Sup. Brk. Out
Assem. Edit. – 49.00
Star Raiders – 45.00
Basketball – 28.00
Chess – 32.00

Other "ATARI" Hard / Software Avail. !!

"APPLE II Plus"



48k – $ 1250.00
64k – $ 1380.00

Other "APPLE" Equip. Avail. !!

TERMINALS

☆ADDS☆ VIEWPOINT
$579.00



SOROC



IQ 120

FACTORY WARRANTY
One year unconditional on CRT and keyboard. All else unconditionally warranted forever.

$689.00

★ MONITORS ★

ZENITH [1] 12in. 15MHz.
1. Green Phos. Hi-Res. → $118.50 ☆

J.C.S. [2] 12in. 18MHz.
2. Green Phos. Hi-Res. → $169.50 ☆

AMDEK [3] 12in. 12MHz.
Non glare Screen
3. Green Phos. → $155.50 ☆
Hi-Res.

13in Color [3a]
3a. Lo-Res. → $375.50 ☆

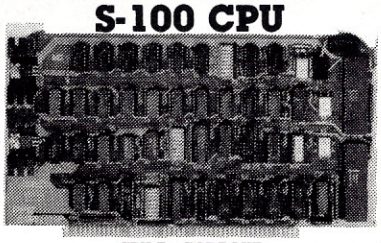
Bare Bones APPLE II

w/o Keyboard
$450.
w/o Pwr. Supply

✓See List of Advertisers on page 178

PRIORITY ONE ELECTRONICS

S-100 CPU



CPU-Z - GODBOUT
2/4 MHZ Z80 CPU 24 Bit Addressing WOW!

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
KCGBT 160A	A & T	$295.00	$199.00
KCGBT 160C	CSC 3-6 MHZ	$395.00	$375.00

DUAL PROCESSOR 8085-8088 - GODBOUT
6 or 8 MZ Provides true 16 Bit Power with a standard 8 bit S-100 bus.

KCGBT 1612A	A & T	6 MHZ	$425.00	$399.00
KCGBT 1612C	CSC	8 MHZ	$525.00	$498.00

SOLID STATE DISK DRIVE, 3500% FASTER!
Not Really, But the Next Best Thing For Godbout 8085/88 Users. Call for Details on M-Drive. See Page 340 of November **BYTE**

KCGBT MD 128K	$1,550.00
KCGBT MD 256K	$3,000.00

2810 Z80 CPU-CA. COMP. SYST.
2/4 MHZ Z80A CPU with RS232C Serial I/O Port complete with Monitor PROM for 2422 Disk Controller

KCCCS 2810A	A & T	$350.00	$280.00

CB2 Z80 CPU - S.S.M.
2/4 MHZ will accept 2716, or 2732, or RAM RUN/STOP and single step switches

KCSSMCB2K	Kit	$260.00
KCSSMCB2A	A & T	$310.00
KCSSMZ80M	SSMZ80 Monitor	$89.00

CBIA 8080 CPU - S.S.M.
8080 CPU, 1K RAM, Holds 1 2708, 1 Bit parallel input port.

KCSSMCB1K	Kit	$183.00
KCSSMCB1A	A & T	$225.00
KCSSM8080M	SM 8080 Monitor	$59.00

S-100 I/O BOARDS

SYSTEM SUPPORT 1 - GODBOUT
Serial port (software prog baud), 4K EPROM OR RAM provision, 15 levels of interrupt, real time clock, optional math processor

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
KCGBT162A	Assembled & Tested	$399.00	$360.00
KCGBT162C	CSC	$495.00	$460.00
KCGBT8231	Math Chip		$195.00
KCGBT8232	Math Chip		$195.00
KCGBT162AM1	A&T with 8231 Math Chip		$555.00
KCGBT162CM1	CSC with 8231 Math Chip		$655.00
KCGBT162AM2	A&T with 8232 Math Chip		$555.00
KCGBT162CM2	CSC with 8232 Math Chip		$655.00

MPX CHANNEL BOARD - GODBOUT
I/O Multiplexer, using 8085A-2 CPU on board

KCGBT166A	A & T	$495.00	$450.00
KCGBT166C	CSC	$595.00	$550.00

INTERFACER I - GODBOUT
Two Serial I/O

KCGBT133A	A & T	$249.00	$219.00
KCGBT133C	CSC	$324.00	$298.00

INTERFACER II - GODBOUT
Three parallel, one serial I/O board

KCGBT150A	A & T	$249.00	$219.00
KCGBT150C	CSC	$324.00	$289.00

INTERFACER III - GODBOUT
Eight channel multi-use serial I/O board

KCGBT1748A	A & T	$699.00	$629.00
KCGBT1748C	CSC 200 hr. Burn In	$849.00	$629.00

INTERFACER 3 WITH 5 SERIAL PORTS

KCGBT1745A	A & T	$599.00	$559.00
KCGBT1745C	CSC 200 hr. Burn In	$699.00	$629.00

MULTI I/O - MORROW DESIGNS
Three Serial, Two parallel

KCMDSMB3200	A & T	$359.00	$329.00

SWITCHBOARD - MORROW DESIGNS
Two serial I/O, four parallel I/O, one status port, one strobe port

KCMDSSB2411		$299.00	$269.00

I/O4 - SSM
Two serial I/O, two parallel I/O

KCSSMI04K	Kit		$210.00
KCSSMI04A	A & T	$290.00	$260.00

I/O 5 - SSM
2 Serial, 3 Parallel including 1 Centronics

KCSSMI05I	A & T	$329.00	$309.00

I/O 8 - SSM
8 Port Serial I/O with Timer

KCSSMI08A	A & T	$550.00	$495.00

2710 4 PORT SERIAL - CCS
4 Full handshaking RS232 ports and optional 2K ROM

KCCCS271001	A & T	$360.00	$310.00

2718 2 SERIAL & 2 PARALLEL - CCS
2 RS232 C ports, 2 8 bit parallel ports, & optional 2K ROM

KCCCS271801	A & T	$360.00	$325.00

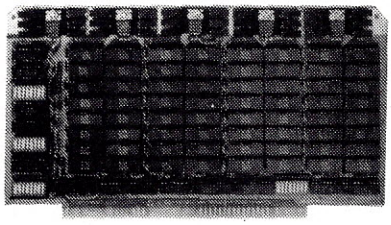
2720 4 PORT PARALLEL - CCS
4 8 bit parallel ports and optional 2K ROM

KCCCS272001	A & T	$250.00	$225.00

S-100 10 MHZ STATIC RAM

NEW LOW PRICES!

RAM 20 - 32K
SALE $299.00



32K STATIC RAM - GODBOUT
RAM 20 10 MHZ, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
KCGBT164AA8	8K A&T	$210.00	$190.00
KCGBT164AC8	8K CSC	$280.00	$260.00
KCGBT164AA16	16K A&T	$285.00	$260.00
KCGBT164AC16	16K CSC	$355.00	$325.00
KCGBT164AA24	24K A&T	$355.00	$325.00
KCGBT164AC24	24K CSC	$425.00	$385.00
KCGBT164AA32	32K A&T	$425.00	$299.00
KCGBT164AC32	32K CSC	$495.00	$450.00

CMOS STATIC RAM
For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of **BYTE.**

64K CMOS STATIC RAM - GODBOUT
RAM 17, 10 MHZ, 2 Watt, DMA Compatable 24 Bit Addressing

KCGBT175A48	48K A&T	$650.00	$619.00
KCGBT175C48	48K CSC 200hr.	$750.00	$710.00
KCGBT175A64	64K A&T	$795.00	$755.00
KCGBT175C64	64K CSC 200hr.	$895.00	$850.00

NEW! 32K x 16 BIT CMOS STATIC RAM - GODBOUT
RAM 16 10 MHZ, 32K x 16 or 64K x 8 IEEE/696 16 BIT 2 Watt, 24 Bit Addressing

KCGBT180A	64K A&T	$895.00	$850.00
KCGBT180C	64K CSC	$995.00	$945.00

NEW! 128K NMOS STATIC RAM - GODBOUT
RAM 21 10MHZ 128K X 8 OR 64K x 16 IEEE/696 8 or 16 Bit 1.2 Amps 24 Bit Addressing

KCGBT167A	128K A&T	$1695.00	$1610.00
KCGBT167C	128K CSC	$1895.00	$1795.00

S-100 PROM

PBI PROM PROGRAMMER - SSM
Programs 2708 or 2716's, operates as a 4K/8K EPROM BOARD AS WELL.

KCSSMPB1K	Kit		$179.00
KCSSMPB1A	A & T	$265.00	$220.00

ECONOROM 2708 - GODBOUT
16K x 8 EPROM Board using 2708, Power on jump to any 256 byte

KCGBT125A	A & T	$135.00	$120.00
KCGBT125C	CSC	$195.00	$175.00

MB8A - SSM
1K/16K 2708 EPROM board, disable in 1K increments

KCSSMMB8AK	Kit		$114.00
KCSSMMB8AA	A & T	$179.00	$159.00

S-100 VIDEO BOARDS

SPECTRUM - GODBOUT
Color Graphics board with Parallel I/O

KCGBT144A	A & T	$399.00	$349.00
KCGBT144C	CSC	$449.00	$399.00
KCGBT2D	Sublogic Universal Graphics Interpreter Software		$35.00

VB - 3 S.S.M.
80 x 25 or 50 character video display Memory Mapped, Parallel Keyboard port

KCSSMVB3K24	80 x 24 Kit		$425.00
KCSSMVB3A24	80 x 24 A&T	$499.00	$440.00
KCSSMVB3UP	80 x 50 Line Upgrade		$ 39.00

VB2-S.S.M.
I/O Mapped Video Board, with Parallel Keyboard port 64 x 16

KCSSMVB2K	Kit		$199.00
KCSSMVB2A	A & T	$269.00	$229.00

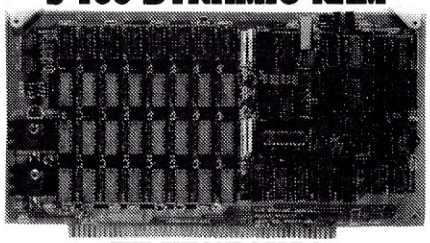
VBBB - S.S.M
Memory Mapped Video Board 64 x 16 character display or 64 x 16 graphics display

KCSSMVB1K	Kit		$179.00
KCSSMVB1A	A & T	$242.00	$220.00

S-100 MOTHERBOARDS - GODBOUT
Active termination, 6-12-20 slot

KCGBT153A	A&T 6 slot, 2 lbs	$140.00	$126.00
KCGBT153C	CSC 6 slot, 2 lbs.	$190.00	$175.00
KCGBT154A	A&T 12 slot, 3 lbs.	$175.00	$155.00
KCGBT154C	CSC 12 slot, 3 lbs.	$240.00	$220.00
KCGBT155A	A&T 20 slot, 4 lbs.	$265.00	$235.00
KCGTB155C	CSC 20 slot, 4 lbs.	$340.00	$310.00

S-100 DYNAMIC RAM



THE EXPANDABLE 1
PRIORITY 1 ELECTRONICS
THE EXPANDABLE 1™ 64K Dynamic Ram board provides your S-100 system with 64K of reliable, high-speed dynamic RAM. Compatable with most of the major S-100 systems on the market, including those with front panels, it supports DMA operations and requires no Wait states with current microprocessors.
- *User expandable from 16 to 64K*
- *Supports DMA*
- *Designed to IEEE proposed S-100 bus standards*
- *2 or 4 MHz operation*
- *Operates with either an 8080 or Z-80 based S-100 system, providing processor-transparent refreshes with both*
- *Supports IMSAI-type front panels*
- *Jumper-selectable Phantom input*
- *Uses Popular 4116 RAMS*
- *All ICs in sockets*
- *Any 16K block can be made bank-independent*
- *Fully buffered address and data lines*
- *Fail-safe refresh circuitry for extended Wait states*
- *Board configuration with reliable, easy-to-configure Berg jumpers*

KCPRIEXP116	16K Assembled & Tested	$299.00
KCPRIEXP132	32K Assembled & Tested	$339.00
KCPRIEXP148	48K Assembled & Tested	$379.00
KCPRIEXP164	64K Assembled & Tested	$409.00

S-100 DISK CONTROLLERS

2422A - CA. COMP. SYST.
I/O Mapped, controls 8", single or double density A&T with CPM 2.2 8" S.D.

		LIST PRICE	OUR PRICE
KCCCS2422A		$475.00	$375.00

DISK JOCKEY 2D - MORROW
Memory Mapped, controls 8", single or double density, serial I/O

KCMDKCJ2208	A&T with CP/M 2.2	$399.00	$375.00

S-100 DISK SUBSYSTEMS

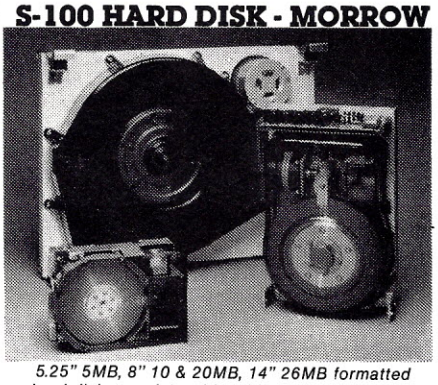
DJ2B DISCUS SINGLE SIDED MORROW
8" DBL Density drives with cabinet, power supply controller, with CP/M 2.2 and Microsoft Basic

KCMDSF1218	Single Drive System	$1095.00	$950.00
KCMDSF1228	Dual Drive System	$1875.00	$1598.00

DJ2B DISCUS DOUBLE SIDED - MORROW
8" DBL Density/sided drives with cabinet Power supply controller, with CP/M 2.2 and Microsoft Basic

KCMDSF2218	Single Drive System	$1395.00	$1250.00
KCMDSF2228	Dual Drive System	$2495.00	$2050.00

S-100 HARD DISK - MORROW



5.25" 5MB, 8" 10 & 20MB, 14" 26MB formatted hard disk complete with cabinet, P.S., Controller, CP/M 2.2 and Microsoft MBASIC 80

		LIST PRICE		SALE PRICE
KCMDKCMAM5	5 MB	$2495.00		$1995.00
KCMDSM10S	10 MB	$3695.00	WOW!	$2950.00
KCMDSM20S	20 MB	$4795.00		$3825.00
KCMDSM26S	26 MB	$4495.00		$3495.00

VIDEO MONITORS

VM121 - ZENITH
15 MHz 12" P31 Green phospher 40 or 80 characters per line

KCZVM121	20 lbs.	$159.00	$139.00

VM4509 - SANYO
10MHz, 9" 16 x 64 P4 B&W monitor

KCSYOVM4509	15 lbs.	$235.00	$198.00

DM5012 - SANYO
18MHz, 12" 24 x 80 P4 B&W monitor

KCSYODM5012	24 lbs.	$340.00	$310.00

DM5112 - SANYO
18MHz, 12" 24 x 80 P31 Green on Black display

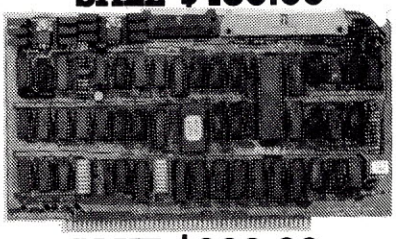
KCSY05112	24 lbs.	$360.00	$325.00

VM6013 - SANYO
COLOR 13" 16 line x 64 character monitor

KCSYOVM6013	35 lbs	$550.00	$95.00

PRIORITY ONE ELECTRONICS

GODBOUT DMA DISK 1 WITH FREE CPM 2.2 SALE $450.00



SAVE $220.00

Priority 1 Electronics is pleased to offer the GODBOUT DISK 1 High Performance Disk Controller at our regular low price with CP/M 2.2 and BIOS at no additional cost. That's a savings of $220.00 of the manufacturer's list price.

- *Third generation INTEL 8272/NEC 765A LSI floppy disk controller.*
- *High speed cycle stealing DMA interface for processor independent data transfer between system memory and flexible disk.*
- *Handles up to four 8 or 5.25 inch floppy disk drives*
- *Single or double density/single or double sided capability.*
- *Supports IBM 3740 soft sectored formats.*
- *24 bit DMA addressing with data transfer across 64K boundaries for data transfer throughout the 16Mbyte memory map.*

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
KCPDB171ACPM	A&T w/CP/M 2.2 & BIOS	$670.00	$450.00
KCGBT171C	CSC	$595.00	$555.00
KCGBTCPM80*	CP/M 2.2 for Z80/8085 with manuals & BIOS 8" S/D disk		$175.00
KCGBTOAS8S	Oasis 8 bit single user 8" S/D disk		$500.00
KCGBTOAS8M	Oasis 8 bit multiuser, 8" S/D disk		$850.00

S-100 SYSTEMS

SUPERSIXTEEN — GODBOUT

HERE IS WHAT EACH PACKAGE INCLUDES:

KCGBT1612A *6 MHz 8085/8088 Dual Processor Board*
KCGBT171A *High Speed DMA Disk Controller*
KCGBT162A *System Support 1 Multi-Function Board*
KCGBT133A *Interfacer 1 Dual Serial I/O*
KC128K 10MHz *Low Power Static Ram*
KCGBTCP/M 86 *16 Bit Operating System Ready to Load & Go*
Cables and Documentation *Three interfacer cables one disk I/O cable, complete documentator for all hardware, and manuals for both CP/M operating systems.*
Compu Pro's *famous* **1 Year** *limited warranty.*

Now to the best part of all. If purchased separately, these quality components would list for $4,344.00. **BUT SuperSixteen's low package price is an amazing $3,495.00. You save $849.00!** *(For boards qualified under the Certified System Component high-reliability program - with extended 2 year warranty, 200 hour burn-in and 8 MHz processors - add $600.00 to the package price.* Sh. Wt. 15 lbs.

KCPDBGBTSJ	SuperSixteen A&T	$3495.00
KCPDBGBTSK	SuperSixteen CSC	$4095.00

PRINTERS

BEST PRICE!



MICROLINE — OKIDATA

WITH FRICTION AND TRACTOR FEED

- *BI-DIRECTIONAL - 120 CPS*
- *9x9 Matrix (Alphanumeric)*
- *6x9 or 12 Matrix for Graphics*
- *5,8.3, 10,16 Charactrs p/Inch*
- *6 or 8 Lines per Inch*
- *80 CPL@10 CPI for 82A*
- *132 CPL@10 CPI for 83A*
- *Parallel and Serial I/O*
- *100 Thru 1200 Baud*
- *Self Test*
- *Out of Paper Switch*
- *Friction or Tractor Feed*
- *3" to 14" Top of Form (Switch Selectable)*
- *10 Different Character Sets*

PART NO.	DESCRIPTION	LIST PRICE	SALE PRICE
KCOKIDAT82AT(26 lbs)	80 CPL @ 10 CPI	$ 799.00	$539.00
KCOKIDAT83AT (37 lbs)	132 CPL @ 10 CPI	$1195.00	$750.00
KCOKISER2KBF	9600 baud with 2K Serial Buffer upgrade with X-on Y-off		$159.00
KCOKIGRAPH	High Resolution Graphics Prom		$99.00

CALL FOR THE NEW MICROLINE 84

MX80 — EPSON

NEED WE SAY MORE?

KCEPNMX80	Tractor Feed 17 lbs	$645.00	$450.00

PRINTER INTERFACES - MICROBYTE

RS232 Serial Conversion for MX80

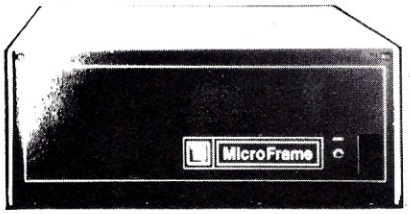
KCMBSSEI1	A & T	$55.00

Apple Centronics 8 bit parallel interface for Centronics, Epson & OKIDATA printers

KCMBSAEI1	A & T	$55.00
KCMBSAEC1	Cable for above	$14.95

Printer interfaces & cables sold only with printer purchase

S-100 MAINFRAMES



S-100 MICROFRAME - TEI

110V 60HZ CVT Mainframes, the best money can buy!
12 Slot ±8V 17A±16V @ 2A
22 Slot ±8V @ 30A± 16V @ 4A

PRIORITY 1 has delayed the 8% TEI Price Increase until March 1st. ORDER TODAY!

PART NO.		LIST PRICE	OUR PRICE 1-9	10-24
KCTEIMCS 112	12 Slot Desk	$685.00	$615.00	$570.00
KCTEIMCS 122	22 Slot Desk	$825.00	$760.00	$705.00
KCTEIRM 12	12 Slot Rackmount	$725.00	$720.00	$619.00
KCTEIRM 22	22 Slot Rackmount	$875.00	$850.00	$750.00

Shipping Weight: On 12 Slot Mainframe 45 lbs. On 22 Slot Mainframes 55 lbs.

TEI S-100 FRAMES

3 - 5" DISK CUTOUTS

±8V @ 17±16V @ 1.2A, Internal Cables

			1-9	10-24
KCTEITF12	12 Slot desk	$675.00	$625.00	$580.00
KCTEIRF12	12 Slot Rackmount	$795.00	$715.00	$665.00

Shipping Weight: On 12 Slot Desk 40 lbs. On 12 Slot Rackmount 45 lbs.

DUAL 8" DISK DRIVE CHASSIS - TEI

For Shugart 800/801R or 850/851R with internal power cables provided
+24V @ 1.5A+5V @ 1.0A - 5V @ .25A

			1-9	10-24
KCTEIDFDO	Desk Top	$535.00	$485.00	$455.00
KCTEIRFDO	Rack Mount	$720.00	$670.00	$630.00
KCPDBDFDOS1	DFDO with 1 Shugart 801R			$970.00
KCPDBDFDOS2	DFDO with 2 Shugart 801Rs			$1375.00
KCPDBRFDOS1	RFDO with 1 Shugart 801R			$1095.00
KCPDBRFDOS2	RFDO with 2 Shugart 801Rs			$1495.00
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Due to UPS shipping regulations, disk drives will be shipped separately from the cabinet. Don't forget to include shipping for each drive. (Snipping Weight, 16 lbs each.)

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110V 60HZ CVT Mainframe uses famous 20 slot GODBOUT Motherboard. 55 lbs.

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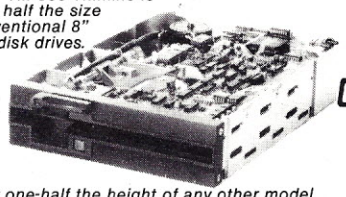
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ONE

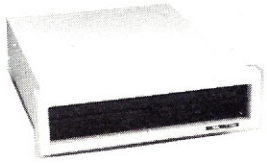
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Automatically Installs Itself Into Your Present CP/M® 2.2 Operating system & Floppy Disk Hardware.
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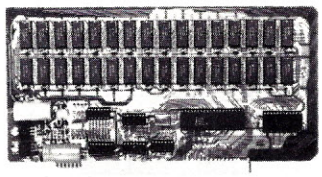
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ELECTRIC MOUTH



for S100, Elf II, Apple TRS-80, Level II* **From $99.95 kit**

Now — teach your computer to talk, increasing interaction between you and your machine.

That's right: the ELECTRIC MOUTH actually lets your computer talk! Installed and on-line in just minutes, it's ready for spoken-language use in office, business, industrial and commercial applications, and in games, special projects, R&D, education, security devices — there's no end to the ELECTRIC MOUTH's usefulness. Look at these features:

- Supplied with 143 letters/words/phonemes/numbers, capable of producing hundreds of words and phrases.
- Expandable on-board up to thousands of words and phrases with additional speech ROMs (see new speech ROM described below).
- Four models, that plug directly into S100, Apple, Elf II and TRS-80 Level II computers.
- Get ELECTRIC MOUTH to talk with either Basic or machine language (very easy to use, complete instructions with examples included).
- Uses National Semiconductor's "Digitalker."*
- Includes on-board audio amplifier and speaker, with provisions for external speakers.
- Installs in just minutes.

Principle of Operation: The ELECTRIC MOUTH stores the digital equivalents of words in ROMs. When words, phrases and phonemes are desired, they simply are called for by your program and then synthesized into speech. The ELECTRIC MOUTH system requires none of your valuable memory space except for a few addresses if used in memory mapped mode. In most cases, output ports (user selectable) are used.

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two	nineteen	cancel	down	is	of	second	d u
three	twenty	case	equal	it	off	set	e v
four	thirty	cent	error	kilo	on	space	f w
five	forty	400hertz tone	feet	left	out	speed	g x
six	fifty	80hertz tone	flow	less	over	star	h y
seven	sixty	20ms silence	fuel	lesser	parenthesis	start	i z
eight	seventy	40ms silence	gallon	limit	percent	stop	j
nine	eighty	80ms silence	go	low	please	than	k
ten	ninety	160ms silence	gram	lower	plus	the	l
eleven	hundred	320ms silence	great	mark	point	time	m
twelve	thousand	centi	greater	meter	pound	try	n
thirteen	million	check	heve	mile	pulses	up	o
fourteen	zero	comma	high	milli	rate	volt	p
fifteen	again	control	higher	minus	re	weight	q
sixteen	ampere	danger	hour	minute	ready	a	r
seventeen	and	degree	in	near	right	b	s

ADDITIONAL VOCABULARY NOW AVAILABLE (VOX II)

abort	complete	fifth	light	put	station
add	continue	fire	load	quarter	switch
adjust	copy	first	lock	range	system
alarm	correct	floor	longer	reached	temperature
alert	crease	fourth	more	receive	test
all	"de"	forward	move	record	"th"
ask	deposit	from	next	reverse	thank
assistance	dial	gas	no	red	third
attention	door	get	normal	repair	this
blue	east	going	north	repeat	turn
brake	"ed"	green	not	replace	under
button	emergency	hale	notice	room	use
buy	enter	heat	open	safe	waiting
call	entry	hello	operator	second	warning
called	"er"	help	or	secure	was
caution	"eth"	hurts	pass	select	water
celsius	evacuate	hold	per	send	west
centigrade	exit	hot	power	service	wind
change	fail	in	press	side	window
circuit	failure	incorrect	pressure	slow	yellow
cigar	fahrenheit	intruder	process	slower	yes
close	fast	key	pull	smoke	zone
cold	faster	level	push	south	

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☐ **VOX II (Second Word Set) . . . . . $ 39.95**

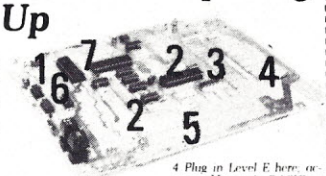
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4. Plug in Level E here; accepts Microsoft, BASIC or Editor/Assembler in ROM
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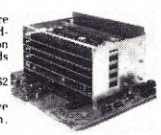
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LEVEL B — This "building block" converts the motherboard into a two-slot S100 bus (industry standard) computer. Now you can plug in any of the hundreds of S100 cards available.

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☐ 8k ROM version of Microsoft BASIC (requires Level B & Level E and 4k RAM; just plug into your Level E sockets. We suggest either the 4k Level D RAM expansion or a 16k S100 "JAWS.") . . . **$99.95** plus $2 P&I.*
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☐ Editor/Assembler (Cassette version; requires Level "B" and 8k (min.) of RAM — we suggest 16k "JAWS" — see above) . . . **$59.95** plus $2 P&I.*
☐ Editor/Assembler (ROM version, supplied on an S100 card; requires Level B and 4k RAM (min.) — we suggest either Level D or 16k "JAWS") . . . **$99.95** plus $2 P&I.*

8" FLOPPY DISK — A remarkable "building block." Add our 8" floppy disk when you need faster operation, more convenient program storage, perhaps a business application, and access to the literally thousands of programs and program languages available today. You simply plug them into your Explorer/85 disk system — it accepts all IBM-formatted CP/M programs.

☐ 8" Floppy Disk Drive . . . **$499.95** plus $12 P&I.*
☐ Floppy Controller Card . . . **$199.95** plus $2 P&I.*
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☐ Drive Cables (set up for two drives) . . . **$25.00** plus $1.50 P&I.*
☐ CP/M 2.2 Disk Operating System; includes Text Editor/Assembler, dynamic debugger, and other features that give your Explorer/85 access to thousands of existing CP/M-based programs . . . $150.00 postpaid.

NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note: disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).

☐ AP-1 Power Supply kit (8V @ 5 amps) in deluxe steel cabinet . . . **$39.95** plus $2 P&I.*



NEED A TERMINAL? We offer you choices: the least expensive one is our Hex Keypad/Display kit that displays the information on a calculator-type screen. The other choice is our ASCII Keyboard/Computer Terminal kit, that can be used with either a CRT monitor or a TV set (if you have an RF modulator).

☐ Hex Keypad/Display kit . . . **$69.95** plus $2 P&I.*

☐ ASCII Keyboard/Computer Terminal kit featuring a full 128 character set, u&l case, full cursor control, 75 ohm video output, convertible to baudot output, selectable baud rate: RS 232-C or 20 ma I/O, 32 or 64 character by 16 line formats . . . **$149.95** plus $3 P&I.*



☐ Steel Cabinet for ASCII Keyboard/Terminal . . . **$19.95** plus $2.50 P&I.*
☐ RF Modulator kit (allows you to use your TV set as a monitor) . . . **$8.95** postpaid.
☐ 12" Video Monitor (10MHz bandwidth) . . . **$139.95** plus $5 P&I.*
☐ Deluxe Steel Cabinet for the Explorer/85 . . . **$49.95** plus $3 P&I.*
☐ Fan for cabinet . . . **$15.00** plus $1.50 P&I.*



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☐ **Experimenter Pak** (Save $53.40) — You get Level A (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level A Hex Monitor Source Listing, and AP-1,5-amp. power supply . . . (Reg. $279.95) SPECIAL **$219.95** plus $6 P&I.*
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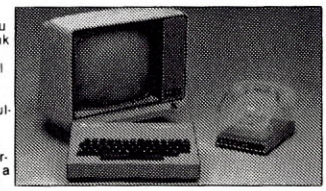
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5082-7760 .43"CC	.79
MAN74 .3"CC	.99
MAN72 .3"CA	.99

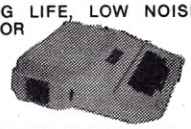
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MC1330	1.89
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LM741	.29
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- EXTRA PLUG-IN CARDS CAN CAUSE YOUR APPLE TO OVERHEAT
- ULTRA-QUIET APPLE FAN DRAWS COOL AIR THROUGH YOUR COMPUTER
- ELIMINATES DOWN TIME
- SAVES REPAIR CHARGES
- INCREASES RELIABILITY
- CLIPS ON — NO HOLES OR SCREWS
- COLOR MATCHES APPLE
- LONG LIFE, LOW NOISE MOTOR



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14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39
ST = SOLDERTAIL		
8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
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WW = WIREWRAP		

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7808T	.99	7912T	.89
7812T	.79	7915T	1.19
7815T	.99	7924T	1.19
7824T	.99		
7805K	1.39	7905K	1.49
7812K	1.39	7912K	1.49
7815K	1.39	79LO5	.79
78LO5	.69	79L12	.79
78L12	.69	79L15	.79
78L15	.69		
		LM317K	3.95
LM309K	1.49	LM323K	4.95
LM317T	1.95	LM337K	3.95

T = TO-220 K = TO-3 L = TO-92

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LM317K	3.95
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LM3900	.59
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75452V	.39
75453V	.39

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74S03	.48	74S86	1.44	74S169	5.44	74S260	1.83
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74S08	.48	74S114	1.50	74S181	4.47	74S280	2.90
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74S11	.88	74S133	.98	74S189	14.95	74S289	6.98
74S15	.70	74S134	.69	74S194	2.95	74S301	6.95
74S20	.68	74S135	1.48	74S195	1.89	74S373	3.45
74S22	.98	74S138	1.08	74S196	4.90	74S374	3.45
74S30	.48	74S139	1.25	74S197	4.25	74S381	7.95
74S32	.98	74S140	1.45	74S201	14.95	74S387	5.75
74S37	1.87	74S151	1.19	74S225	8.95	74S412	2.98
74S38	1.68	74S153	1.19	74S240	3.98	74S471	9.95
74S40	.44	74S157	1.19	74S241	3.75	74S472	16.85
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74S64	.79	74S161	2.85	74S251	1.90	74S482	15.60
74S65	1.25	74S162	3.70	74S253	7.45	74S570	7.80
						74S571	7.80

7400 SERIES

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7401	.19	7453	.23	74141	.65	74190	1.15
7402	.19	7454	.23	74142	2.95	74191	1.15
7403	.19	7460	.23	74143	2.95	74192	.79
7404	.19	7470	.35	74144	2.95	74193	.79
7405	.22	7472	.29	74145	.60	74194	.85
7406	.22	7473	.34	74147	1.75	74195	.85
7407	.22	7474	.35	74148	1.20	74196	.79
7408	.24	7475	.49	74150	1.35	74197	.75
7409	.19	7476	.35	74151	.65	74198	1.35
7410	.19	7480	.59	74152	.65	74199	1.35
7411	.25	7481	1.10	74153	.55	74221	1.35
7412	.30	7482	.95	74154	1.40	74246	1.35
7413	.35	7483	.50	74155	.75	74247	1.25
7414	.55	7485	.65	74156	.65	74248	1.85
7416	.25	7486	.35	74157	.55	74249	1.95
7417	.25	7489	4.95	74159	1.65	74251	.75
7420	.19	7490	.35	74160	.85	74259	2.25
7421	.35	7491	.40	74161	.70	74265	1.35
7422	.29	7492	.50	74162	.85	74273	1.95
7423	.29	7493	.49	74163	.85	74276	1.25
7425	.29	7494	.65	74164	.85	74279	.75
7426	.29	7495	.55	74165	.85	74283	2.00
7427	.29	7496	.70	74166	1.00	74284	3.75
7428	.45	7497	2.75	74167	2.95	74285	3.75
7430	.19	74100	1.00	74170	1.65	74290	.95
7432	.29	74107	.30	74172	5.95	74293	.75
7433	.45	74109	.45	74173	.75	74298	.85
7437	.29	74110	.45	74174	.89	74351	2.25
7438	.29	74111	.55	74175	.89	74365	.65
7440	.19	74116	1.55	74176	.89	74366	.65
7442	.49	74120	1.20	74177	.75	74367	.65
7443	.65	74121	.29	74178	1.15	74368	.65
7444	.69	74122	.45	74179	1.75	74376	2.20
7445	.69	74123	.55	74180	.75	74390	1.75
7446	.59	74125	.45	74181	2.25	74393	1.35
7447	.69	74126	.45	74182	.75	74425	3.15
7448	.69	74128	.55	74184	2.00	74426	.85
7450	.19	74132	.45	74185	2.00	74490	2.55

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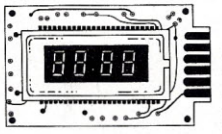
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National Semiconductor RAM SALE

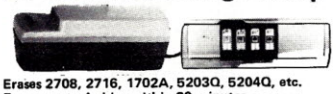
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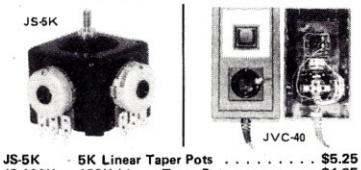


- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact – only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

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The **dependable, low cost, largest selling fan for commercial cooling applications.**

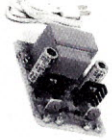
- 105cfm free air delivery
- 4.68" sq. x 1.50" depth. Weight - 17 oz.
- acoustical rating as low as NC-38
- more than 10 yrs. cont. duty at 10°C
- impedance protected
- for ambients to 70°C
- UL yellow card recognized & CSA approved

Model No. MU2A1, Part No. 02821, Bearing—Sleeve, 115V, 50/60Hz, 14 Watts, 105cfm

MU2A1 . . . . $9.95 ea.

NEW! JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.



FEATURES:
- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2"w x 5-1/16"L x 2"H

JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95

(Picture not shown but similar in construction to above)

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JE205 Adapter Brd. (to JE200) ±5, ±9 & ±12V. $12.95
JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. $19.95

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DATA ACQUISITION (CONTINUED)

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AY-5-1013	30K BAUD UART	6.95

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21L02	1024x1 Static	1.95
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2114L	1024x4 Static 450ns Low Power	2.49
2114-2	1024x4 Static 200ns	2.49
2114L-2	1024x4 Static 200ns Low Power	2.95
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4164N-3	64K Dynamic 200ns	14.95
MM2147N	4096x1 Fast 70ns	4.95
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MM5280/2107	4096x1 Dynamic	4.95
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TMS2716	16K EPROM (-5V, +5V, +12V)	9.95
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2732 Intel TI	32K EPROM	17.95
2758	8K EPROM (450ns) (Single +5V)	7.49
2764Q	64K EPROM (Hitachi HN462764)	49.95
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— Over 30 More PROMS Listed in Our Catalog —

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MCM66750P	128x9x7 Alpha. Control Char. Gen.	13.50

MICROPROCESSOR MANUALS

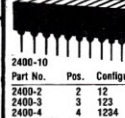
M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00

SPECIAL FUNCTION

DS0025CN	Dual MOS Clock Driver (SMZ)	3.50
DS0026CN	Dual MOS Clock Driver (SMZ)	1.95
INS1771N-1	Floppy Disc Controller	24.95
INS2651N	Communication Chip	19.95
MM58167N	Microprocessor Real Time Clock	8.95
MM5817AN	Microprocessor Compatible Clock	11.95
COP402N	Microcontroller with 64-Digit RAM and Direct LED Drive	6.95
COP402MN	Microcontroller with 64-Digit RAM & Direct LED Drive w/N Buss Int.	7.49
COP470N	32-Seg.VAC Fluor. Driver (20-pin pkg.)	3.75

TELEPHONE/KEYBOARD CHIPS

AY-5-9100	Push Button Telephone Dialer	1/
AY-5-9200	Repertory Dialer	1/
AY-5-9500	CMOS Clock Generator	
AY-5-2376	Keyboard Encoder (88 keys)	11.
HD0165-5	Keyboard Encoder (16 keys)	7.95
74C922	Keyboard Encoder (16 keys)	5.49
74C923	Keyboard Encoder (20 keys)	5.75
MM53190N	Push Button Pulse Dialer	7.95
MM57499N	96/144-Key Serial Keyboard Encoder	8.95



2400-10

EECO Rocker DIP Switch — "Mini-Dip™" 2400 Series

THE MOST UNIQUE DIP SWITCH AVAILABLE!

MINI-DIP is designed to retrofit all major brands of Dip switches. Unique features include locking rod design to prevent accidental actuation and gold self-wiping contact. One-piece housing and press-fit terminals prevent contamination. 2-10 station Form "A" and 1-5 station Form "C."

- Terminals on .100 x .300 (2.54 x 7.62) centers
- PCB or dip socket mountable
- Positive cleaning/wiping action with gold contact
- Total seal and bottom seal

Part No.	Pos.	Configuration	Socket	Price
2400-2	2	12	8 pin	.79 - 10/ 6.95
2400-3	3	123	8 pin	.89 - 10/ 7.95
2400-4	4	1234	8 pin	.99 - 10/ 8.95
2400-ABCD	4	ABCD	8 pin	.99 - 10/ 8.95
2400-5C	6	C54321	14 pin	1.09 - 10/ 9.95
2400-6	6	123456	14 pin	1.09 - 10/ 9.95
2400-7	7	1234567	14 pin	1.19 - 10/10.95
2400-8	8	12345678	16 pin	1.29 - 10/11.95
2400-9	9	123456789	18 pin	1.39 - 10/12.95
2400-10	10	0123455789	20 pin	1.49 - 10/13.95

JE608 PROGRAMMER
2704/2708 EPROM PROGRAMMER



GENERAL APPLICATIONS:
- To program EPROMS 2704 and 2708.
- Developmental system for microcomputer circuits
- To read the contents of a pre-programmed EPROM
- To compare EPROM(s) for content differences
- To emulate a programmed EPROM
- To store program in RAMS for alterations
- Three separate Display Registers: 8 LED's for Hex Key entries, 10 LED's (2^0-2^9) for Address Register and 8 LED's for Data Memory Register. The Data Memory Register displays the content of the RAMs from the EPROM Chip. Development of microprocessor systems by means of a ribbon cable from the programmer panel test socket to the EPROM socket on the microprocessor board. Rapid checking verification of programmed data changes. User may move data from a master to RAM's or write into RAM's with keyboard entries. Allows manual stepping manipulation (up and down) at any address location. Stand-alone EPROM Programmer consisting of: A 16-key Hexadecimal Keyboard assembly, Programmer Board assembly with 4 power supplies and a LED/Test Socket Panel Board assembly. The Test Socket is zero force insertion type. Power requirements: 115VAC, 60Hz, 6W. Compact desk-top enclosure: Color-coordinated designer's case with light tan panels and molded end pieces in mocha brown. Size: 3¼"H x 11"W x 8¼"D. Weight: 5 lbs.

The JE608 EPROM Programmer is a completely self-contained unit which is independent of computer control and requires no additional systems for its operations. The EPROM can be programmed from the Hexadecimal Keyboard or from a pre-programmed EPROM. The JE608 Programmer can emulate a programmed EPROM by the use of its internal RAM circuits. This will allow the user to test or pretest a program for a system, prior to programming a chip. Any changes in the program can be entered directly into the memory circuits with the Hexadecimal Keyboard so that rewriting the entire program will not be necessary. The JE608 Programmer contains a Programmer/Board w/25 IC's & includes power supplies of: -5V, +5V, +12V and +26V. The Hexadecimal Keyboard and LED/Test Socket Panel board are separate assemblies within the system.

JE608K Kit **$399.95**
JE608A Assembled and Tested **$499.95**

JE608-16K ADAPTER BOARD
FOR 2716/2758 EPROMS

GENERAL DESCRIPTION: The JE608-16K Adapter Board allows the JE608 Programmer to be modified for the additional programming of the 2716 and 2758 EPROMS. The adapter provides for adding an address switch for the 2^{11} bit and also for selecting the proper power and timing pulses to be applied to the EPROM. Programming and emulating the 2716 (16K) EPROM is done separately to each half (1024x8) of the EPROM because of the existing 8K RAM capacity in the JE608 Programmer.

JE608-16K	Adapter Board Kit	$29.95
JE608-Upgrade	(Send assembled JE608 to factory for adapter installation of the JE608-16K Adapter Board Kit)	$99.95
JE608A-16K Mod.	Assembled JE608 w/Adapter (JE608-16K) Installed	$599.95

$10.00 Minimum Order — U.S. Funds Only
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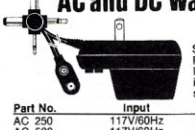
Jameco ELECTRONICS

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3/82 ***PHONE ORDERS WELCOME — (415) 592-8097***

BOOKS
National Semiconductor — Intersil — Intel

30001	**National CMOS Data Book** (640 pages) 74C, CD4000, and A/D Converters	$5.95
30002	**National Interface Data Book** (704 pages) DP, DS8000, DS3600, DS75000, etc.	$5.95
30003	**National Linear Data Book** (1376 pages) LM, LF, ADC, DAC, LH Series	$8.95
30004	**National Series 80 — Board Level Computer** (224 pages)	$4.95
30005	**National TTL Logic Data Book** (624 pages) 7400,LS,L,H,S, and DM8000 Series	$8.95
30006	**Buy above (3) 30001,3,5 as a set**	$19.95/lot
30009	**Intersil Data Book** (1074 pages)	$6.95
010400	**Intel Component Data Catalog** Full data sheets for Intel's products incl. memory devices, microproc., peripherals & indust./mil. products (1328 pages)	$10.00
205610	**Intel Peripheral Design Handbook** Full data sheets, appl. notes for Intel peripheral device components (644 pages)	$7.50

AC and DC Wall Transformers



With Universal Plug and 9V Battery Snap

Selective voltages: 6,9,12VDC. Polarity selection (+/-). six-foot line from adapter to plugs - six-inch line from adapter to battery snap. 120V/60Hz. 300mA.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC1700	117V/60Hz	9VAC 1.7 amp	$3.95
DC6912 (above)	120V/60Hz	6,9,12VDC 300mA	$9.95
DV9200	117V/60Hz	9VDC 200mA	$3.25
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$3.95

CONNECTORS



DB25P	D-Subminiature Plug	$2.95
DB25S	D-Subminiature Socket	$3.50
D20418-2	Screw Lock Hdwr. (2) DB25S/P	2/$.99
DB51226	Cover for DB25P/S	$1.75
22/44SE	P.C. Edge (22/44 Pin)	$2.95
UG88/U	BNC Plug	$1.79
UG89/U	BNC Jack	$3.79
UG175/U	UHF Adapter	$ .49
SO239	UHF Panel Recp.	$1.29
PL258	UHF Adapter	$1.60
PL259	UHF Plug	$1.60
UG260/U	BNC Plug	$1.79
UG1094/U	BNC Bulkhead Recp.	$1.29

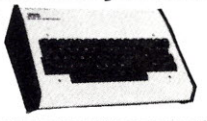
TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K
Kit comes complete with:

- 8 ea. MM5290 (UPD416/4116) 16K Dyn. Ram (*ns)
- Documentation for conversion

TRS-16K2 *150ns 19.95
TRS-16K3 *200ns 16.95
TRS-16K4 *250ns 14.95

JE610 ASCII Encoded Keyboard Kit



The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and -12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3½"H x 14½"W x 8¾"D

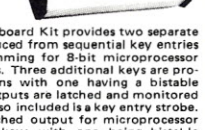
JE610/DTE-AK (After assembled as pictured above) . . . **$124.95**

JE610 Kit 62-Key Board, PC Board, & Components (no case). . . . **$ 79.95**
K62 62-Key Keyboard (Keyboard only) . . . **$ 34.95**
DTE-AK (case only — 3¾"Hx11"Wx8¾"D) **$ 49.95**

NEW! **JE212 — Negative 12VDC Adapter Board Kit for JE610 ASCII KEYBOARD KIT** Provides -12V DC from incoming 5VDC . . **$9.95**

JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD



The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 8¾"W x 8¾"D

JE600/DTE-HK (After assembled as pictured above) **$99.95**

JE600 Kit 19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case) . . **$59.95**
K19 19-Key Keyboard (Keyboard only) **$14.95**
DTE-HK (case only — 3½"Hx8¾"Wx8¾"D) **$44.95**

7400

SN7400N	.20	SN7472N	.29	SN74156N	.79
SN7401N	.20	SN7473N	.35	SN74157N	.69
SN7402N	.25	SN7474N	.35	SN74160N	.89
SN7403N	.25	SN7475N	.49	SN74161N	.89
SN7404N	.25	SN7476N	.35	SN74162N	.89
SN7405N	.29	SN7479N	5.00	SN74163N	.89
SN7406N	.35	SN7480N	.50	SN74164N	.89
SN7407N	.35	SN7482N	.99	SN74165N	.89
SN7408N	.29	SN7483N	.69	SN74166N	1.25
SN7409N	.29	SN7485N	.89	SN74167N	2.79
SN7410N	.25	SN7486N	.35	SN74170N	1.95
SN7411N	.29	SN7489N	1.75	SN74172N	4.95
SN7412N	.35	SN7490N	.49	SN74173N	1.39
SN7413N	.40	SN7491N	.59	SN74174N	.99
SN7414N	.69	SN7492N	.45	SN74175N	.89
SN7416N	.29	SN7493N	.45	SN74176N	.79
SN7417N	.29	SN7494N	.69	SN74177N	.79
SN7420N	.25	SN7495N	.69	SN74179N	1.49
SN7421N	.29	SN7496N	.69	SN74180N	.79
SN7422N	.45	SN7497N	3.00	SN74181N	2.25
SN7423N	.29	SN74100N	1.49	SN74182N	.79
SN7425N	.29	SN74104N	.89	SN74184N	2.49
SN7426N	.29	SN74105N	.89	SN74185N	2.49
SN7427N	.25	SN74107N	.35	SN74190N	1.25
SN7428N	.49	SN74109N	.39	SN74191N	1.25
SN7430N	.25	SN74116N	1.95	SN74192N	.89
SN7432N	.29	SN74121N	.39	SN74193N	.89
SN7437N	.25	SN74122N	.55	SN74194N	.89
SN7438N	.40	SN74123N	.59	SN74195N	.69
SN7439N	.25	SN74125N	.49	SN74196N	.89
SN7440N	.20	SN74126N	.49	SN74197N	.89
SN7441N	.89	SN74132N	.75	SN74198N	1.49
SN7442N	.59	SN74136N	.75	SN74199N	1.49
SN7443N	1.10	SN74141N	.99	SN74221N	1.25
SN7444N	1.10	SN74142N	3.25	SN74251N	.99
SN7445N	.89	SN74143N	3.49	SN74276N	1.95
SN7446N	.79	SN74144N	3.49	SN74279N	.79
SN7447N	.69	SN74145N	.79	SN74283N	1.49
SN7448N	.79	SN74147N	1.95	SN74284N	3.95
SN7450N	.20	SN74148N	1.29	SN74285N	3.95
SN7451N	.20	SN74150N	1.25	SN74365N	.69
SN7453N	.20	SN74151N	.69	SN74366N	.69
SN7454N	.20	SN74152N	.69	SN74367N	.69
SN7459A	.25	SN74153N	.79	SN74368N	.69
SN7460N	.20	SN74154N	1.25	SN74390N	1.49
SN7470N	.29	SN74155N	.79	SN74393N	1.49

74LS

74LS00	.29	74LS92	.75	74LS192	1.15
74LS01	.29	74LS93	.75	74LS193	1.15
74LS02	.29	74LS95	.99	74LS194	1.15
74LS03	.29	74LS96	1.15	74LS195	1.15
74LS04	.35	74LS107	.45	74LS197	1.19
74LS05	.35	74LS109	.45	74LS221	1.19
74LS08	.35	74LS112	.45	74LS240	1.49
74LS09	.35	74LS113	.49	74LS241	1.49
74LS10	.35	74LS114	.49	74LS242	1.49
74LS11	.39	74LS122	.89	74LS243	1.49
74LS12	.35	74LS123	1.25	74LS244	1.49
74LS13	.59	74LS125	.59	74LS245	2.95
74LS14	.99	74LS126	.59	74LS247	1.19
74LS15	.35	74LS132	.99	74LS248	1.19
74LS20	.35	74LS133	.89	74LS249	1.19
74LS21	.35	74LS136	.49	74LS251	.99
74LS22	.35	74LS138	.89	74LS253	.99
74LS26	.35	74LS139	.89	74LS257	.89
74LS27	.35	74LS151	.89	74LS258	.69
74LS28	.35	74LS153	.89	74LS260	.69
74LS30	.35	74LS154	1.75	74LS266	.69
74LS32	.35	74LS155	.89	74LS273	1.95
74LS33	.59	74LS156	.89	74LS279	.89
74LS37	.45	74LS157	.89	74LS283	1.89
74LS38	.39	74LS158	.89	74LS290	.99
74LS40	.35	74LS160	1.15	74LS293	.99
74LS42	.89	74LS161	1.15	74LS298	1.25
74LS47	.89	74LS162	1.15	74LS352	1.29
74LS48	1.15	74LS163	1.15	74LS353	1.29
74LS49	1.15	74LS164	1.15	74LS365	.69
74LS51	.35	74LS165	1.15	74LS366	.69
74LS54	.35	74LS166	1.15	74LS367	.69
74LS55	.35	74LS168	1.19	74LS368	.69
74LS73	.45	74LS169	1.19	74LS373	1.95
74LS74	.45	74LS170	1.95	74LS374	1.95
74LS75	.59	74LS173	.99	74LS375	.89
74LS76	.45	74LS174	.99	74LS386	.69
74LS78	.49	74LS175	.99	74LS393	2.49
74LS83	.89	74LS181	2.95	74LS399	2.49
74LS85	1.25	74LS190	1.25	74LS670	2.49
74LS86	.49	74LS191	1.25	81LS95	1.95
74LS90	.69	74LS195	1.25	81LS97	1.95

74S

74S00	.45	74S124	3.95	74S243	3.25
74S02	.45	74S133	.55	74S244	3.25
74S03	.45	74S134	.69	74S251	1.45
74S04	.55	74S135	1.19	74S253	1.45
74S05	.55	74S136	1.75	74S257	1.35
74S08	.50	74S138	1.35	74S258	1.35
74S09	.50	74S139	1.35	74S260	.79
74S10	.45	74S140	.79	74S280	2.95
74S11	.45	74S151	1.35	74S287	3.25
74S15	.45	74S153	1.35	74S288	2.75
74S20	.45	74S157	1.35	74S373	3.49
74S22	.45	74S158	1.35	74S374	3.49
74S30	.45	74S160	2.95	74S387	2.95
74S32	.55	74S162	2.95	74S471	10.95
74S38	1.25	74S163	2.95	74S472	10.95
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74S86	.79	74S196	1.95	74S572	9.95
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CA3023H	3.25	CA3081N	2.00	CA3130H	1.39
CA3035H	2.49	CA3082N	2.00	CA3140H	1.25
CA3039H	1.35	CA3083N	1.60	CA3160H	1.25
CA3046N	1.30	CA3086N	.85	CA3401N	.59
CA3059N	3.25			CA3600N	3.50

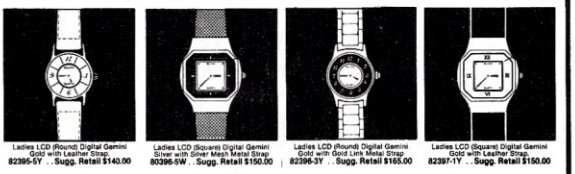
CD–CMOS

CD4000	.39	CD4041	1.49	CD 4098	2.49
CD4001	.39	CD4042	.99	CD4506	.75
CD4002	.39	CD4043	.89	CD4507	.99
CD4006	1.19	CD4044	.89	CD4508	3.95
CD4007	.25	CD4046	1.79	CD4510	1.39
CD4009	.49	CD4047	2.50	CD4511	1.29
CD4010	.49	CD4048	1.35	CD4512	1.49
CD4011	.39	CD4049	.49	CD4513	3.95
CD4012	.25	CD4050	.69	CD4515	2.95
CD4013	.49	CD4051	1.19	CD4516	1.49
CD4014	1.39	CD4052	1.19	CD4518	1.79
CD4015	1.19	CD4053	1.19	CD4519	.89
CD4016	.59	CD4054	2.95	CD4520	1.29
CD4017	1.19	CD4055	2.95	CD4526	1.79
CD4018	.99	CD4056	2.95	CD4528	1.79
CD4019	.49	CD4059	9.95	CD4529	1.95
CD4020	1.19	CD4060	1.49	CD4543	2.79
CD4021	1.39	CD4066	.79	CD4562	11.95
CD4022	1.19	CD4068	.39	CD4566	2.79
CD4023	.29	CD4069	.45	CD4583	2.49
CD4024	.79	CD4070	.55	CD4584	.75
CD4025	.23	CD4071	.49	CD4723	1.95
CD4026	2.95	CD4072	.49	CD4724	1.95
CD4027	.69	CD4073	.39	MC14409	17.95
CD4028	.89	CD4075	.39	MC14410	18.95
CD4029	1.49	CD4076	1.39	MC14411	15.95
CD4030	.49	CD4078	.55	MC14412	15.95
CD4034	3.49	CD4081	.39	MC14419	7.95
CD4035	.99	CD4082	.39	MC14433	15.95
CD4040	1.49	CD4093	.99	MC14538	2.49
				MC14541	1.95

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ONE YEAR FACTORY WARRANTY

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Ladies LCD (Square) Digital Gemini Silver with Silver Mesh Metal Strap 80396-5W . . Sugg. Retail $150.00

Ladies LCD (Round) Digital Gemini Gold with Gold Link Metal Strap 82396-3Y . . Sugg. Retail $165.00

Ladies LCD (Square) Digital Gemini Gold with Leather Strap. 82397-1Y . . Sugg. Retail $150.00

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WHILE THEY LAST! LIMITED QUANTITY!

SALE!

MULTI-DIGIT REFLECTOR ARRAYS FOR CLOCKS

PART NUMBER/ COLOR	CHAR HT (in.)	POLARITY	DESCRIPTION SEGMENT/DIGIT	OVERALL SIZE Length x Height x Depth	LIGHT OUTPUT (MCD) TYP	MIN	@mA	FORWARD VOLTAGE SEGMENT (V) @ Ip = 20mA TYP	MAX	CONTINUOUS FORWARD CURRENT PER SEGMENT (mA) MAX	PRICE	2 FOR SALE
DL-4600 (Red)	.56	C.C. MPX	With Colon and Auxiliary Indicators	3-3/16"x1-1/4"x5/8"	.3	.15	10	1.7	2.8	30	1.95	2/2.95
DL-4601 (Red)				3-3/16"x1"x5/8"	.3	.15					1.75	2/2.95
DL-5407 (Grn)		C.C. non-MPX		3-3/16"x1"x5/8"	.8	.5					4.95	2/7.95
DL-4606 (Red)				3-3/16"x1"x5/8"							2.49	2/2.95

MULTI-DIGIT REFLECTOR ARRAYS

DL-2301 (Red)	.30	C.C. MPX	7 Seg, 2 Digit RHDP	1-1/16" x 1/8" x 1/4"	2.5	1.1	20	1.7	2.8	30	.79	2/.99
DL-5-535 (Grn)	.30	C.A. MPX	5 Seg, 2 Digit	1-5/8"x1"x1-5/8"	2.5	.75	20		3.5	25	.89	2/1.19
DL-460 (Red)	.30	C.C. MPX	5 Seg, 4 Digit RHDP	2" x 1-5/16" x 5/16"	.8	.3	10	1.7	2.8	30	1.49	2/1.95
DL-330 (Red)	1.0	C.A. MPX	7 Seg, 3 Digit RHDP	2-5/8"x1-13/16"x5/8"	1.5	1.0	10	3.4	4.8	30	2.25	2/3.49

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LED NUMERIC ARRAYS

PART NO.	DIGIT SIZE (RED)	FORMAT	DRIVE Comm. Cathode/Comm. Anode	OVERALL SIZE	PRICE
NSA186	.100 (9 Bubble Stick)	8 8 8 8	C.C. 9 Digit Multiplexed	2"L x .72"H x .27"D	$ .99
NSA188	.100 (9 Bubble Stick)	8 8 8 8 8 8 8 8 8	C.C. 9 Digit Multiplexed	2"L x .72"H x .27"D	.99
NSA298	.100 (9 Bubble Stick)	8 8 8 8 8 8 8 8 8	C.C. 9 Digit Multiplexed	1.98"L x .72"H x .27"D	.99
NSA1140	.100 (9 Bubble Stick)	8 8 . 8 8	C.C. 4 Digit Multiplexed	2"L x .72"H x .27"D	.49
NSA1150	.100 (9 Bubble Stick)	8 . 8 8 . 8 8	C.C. 5 Digit Multiplexed	2"L x .72"H x .27"D	.49
NSA1886	.140 (9 Bubble Stick)	8 8 8 8 8 8 8 8	C.C. 8 Digit Multiplexed	2-3/8"L x .72"H x .27"D	.89

MULTI-DIGIT LED NUMERIC DISPLAYS

NSN373	.3 No Decimal	8 8	C.C. 2 Digit Direct	.80"L x .80"H x .225"D	$ .89	2/1.79
NSN374	.3 No Decimal	8 8	C.A. 2 Digit Direct	.80"L x .80"H x .225"D	.79	2/.99
NSN501	.5 No Decimal	8 8	C.A. 2 Digit Direct	1.40"L x 1.14"H x .32"D (1.16" pins)	.89	2/1.49
NSN502	.5 No Decimal	8 8	C.A. 2 Digit Direct	1.40"L x 1.14"H x .32"D (1.16" pins)	.89	2/1.49
NSN581	.5	8 8	C.C. 2 Digit Multiplexed	1"L x 1.05"H x .28"D (.9" pins)	.99	2/1.79
NSN583	.5	8 8	C.C. 2 Digit Direct	1"L x 1.05"H x .28"D (.9" pins)	.99	2/1.79
NSN781	.7	8 8	C.C. 2 Digit Multiplexed	1.2"L x 1.25"H x .3"D	1.19	2/1.95
NSB3180	.3	8 8 8 8 . 8 8 8 8	C.C. 8 Digit (10 Spaced)	4"L x .80"H x .250"D	.75	2/1.89
NSB3001	.3	8 8 8 8	C.C. 4 Digit Multiplexed	1.59"L x .85"H x .25"D (1.16" pins)	.75	2/1.89
NSB3382	.3	+1.8 8 8	C.A. 3½ Digit Multiplexed	1.60"L x .80"H x .225"D	.99	2/1.49
NSB3411	.3	+/- 8 8 . 8 8	C.C. 4 Digit - Colon/PM Indicator	1.6/16"L x 13/16"H x 3/16"D	.99	2/1.19
NSB3582	.3	*1 8 *88 88	C.C. 6 Digit - AM/PM, Failure Ind.	3"L x 1.10"H x .7/32"D	2.95	2/3.95
NSB3864	.3	8 8 8 8 8 8 8 8	C.A. 8 Digit Multiplexed	3"L x 1.3/32"H x 3/16"D	2.95	2/3.95
NSB3881*	.3	8 8 8 8	C.C. 4 Digit Multiplexed	1.59"L x .80"H x .225"D	2.95	2/4.95
NSB3882*	.3	8 8 8 8	C.A. 4 Digit Multiplexed	1.59"L x .80"H x .225"D	2.95	2/4.95
NSB5382*	.5	+1.8 8 8	C.A. 3½ Digit Multiplexed	1.99"L x 1.00"H x .28"D	3.49	2/5.95
NSB5441	.5	*8 8 . 8 8	C.C. 4 Digit - AM/PM, Colon Ind.	3.00"L x 1.10"H x .282"D	2.95	2/3.95
NSB5881*	.5	8 8 8 8	C.C. 4 Digit Multiplexed	1.99"L x 1.00"H x .280"D	3.49	2/5.95
NSB5882*	.5	8 8 8 8	C.A. 4 Digit Multiplexed	1.99"L x 1.00"H x .280"D	3.49	2/5.95
NSB5818	.5	+8 8 8 8	C.C. 3½ Digit Multiplexed	3.00"L x 1.10"H x .282"D	2.49	2/3.49
NSB5822	.5	8 8 8 8 8	C.A. 5 Digit Multiplexed	3.00"L x 1.10"H x .282"D	2.95	2/3.49
NSB7823	.7	8 8 8 8 8 8	C.C. 6 Digit Multiplexed	3.60"L x 1.30"H x .282"D (.9" pins)	3.95	2/4.95

*Standard Stocked Items — only pin-out specifications available on non-stocked items.

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MFD	WVDC	PRICE	MFD	WVDC	PRICE	MFD	WVDC	PRICE
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500	200	2.49	10,000	16	3.95	27,000	10	2.95
1,250	3	.99	11,000	19	4.95	32,500	25	4.95
1,500	25	1.95	11,000	55	5.49	40,000	25	5.95
1,500	50	2.95	11,000	60	5.95	43,000	10	5.95
2,000	10	2.95	13,000	16	2.95	50,000	20	7.95
2,250	100	3.95	14,000	13	2.95	52,000	20	5.95
2,300	33	2.95	14,000	35	3.95	55,000	15	5.95
2,500	15	2.95	18,000	10	3.95	58,000	20	5.95
3,000	25	1.95	20,000	20	2.95	65,000	10	7.95
3,600	40	3.95	20,000	55	3.95	73,800	5	7.95
4,500	50	3.95	21,000	15	3.95	80,000	15	9.95
5,500	25	4.49	23,000	7	1.95	90,000	10	8.95
6,100	40	2.49	23,000	10	2.95	160,000	10	8.95
6,600	50	4.95	23,000	20	3.95	200,000	3	12.95

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8 pin LP	.17	.16	.15
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16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	.37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

SOLDERTAIL STANDARD (TIN)



	1-24	25-49	50-100
14 pin ST	.27	.25	.24
16 pin ST	.30	.27	.26
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
28 pin ST	.99	.95	.81
36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

SOLDERTAIL (GOLD) STANDARD



	1-24	25-49	50-100
8 pin SG	.39	.35	.31
14 pin SG	.49	.45	.41
16 pin SG	.54	.49	.44
18 pin SG	.59	.53	.48
24 pin SG	.79	.75	.69
28 pin SG	1.10	1.00	.90
36 pin SG	1.65	1.40	1.26
40 pin SG	1.75	1.59	1.45

WIRE WRAP SOCKETS (GOLD) LEVEL #3



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10 pin WW	.69	.63	.58
14 pin WW	.79	.73	.67
16 pin WW	.85	.77	.70
18 pin WW	.99	.90	.81
20 pin WW	1.19	1.08	.99
22 pin WW	1.49	1.35	1.23
24 pin WW	1.39	1.26	1.14
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7106EV/Kit*	IC, Circuit Board, Display	34.95
7107CPL	3½ Digit A/D (LED Drive)	15.95
7107EV/Kit*	IC, Circuit Board, Display	29.95
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7117CPL	3½ Digit A/D LED Dis. HLD.	17.95
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7205IPG	CMOS LED Stopwatch/Timer	12.95
7205EV/Kit*	Stopwatch Chip, XTL	19.95
7206CJPE	Tone Generator	5.15
7206CEV/Kit*	Tone Generator Chip, XTL	12.95
7207AIPD	Oscillator Controller	6.50
7207AEV/Kit*	Freq. Counter Chip, XTL	13.95
7208IPI	Seven Decade Counter	17.95
7209IPA	Clock Generator	3.95
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7216CIJI	8-Digit Freq. Counter C.A.	26.95
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7641CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
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74C10	.39	74C157	2.25	74C374	2.59
74C14	.75	74C160	1.69	74C901	.69
74C20	.39	74C161	1.69	74C903	.69
74C30	.39	74C162	1.49	74C911	10.95
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LM320K-5	1.35	LM392N	.69	LM2896P-1	2.25
LM320K-12	1.35	LF398N	4.00	LM3189N	2.95
LM320K-15	1.35	LM399H	5.00	LM3900N	.69
LM320T-5	1.25	TL494CN	4.49	LM3905CN	1.25
LM320T-12	1.25	TL496CP	1.75	LM3909N	1.15
LM320T-15	1.25	NE510A	6.00	LM3914N	3.95
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Flexible Disc 1s Single-Headed Drives Single-Density Media	IBM Compatible (128 B/S, 26 Sectors)	3060	1.99	473071	53428	800506	2305830	FD1-128	FD-1	740-0	S/A 100	15002	FD34-9000	F111111X	421602
	IBM Compatible (128 B/S, 26 Sectors) w/ W P N	3062	2.04	–	–	–	–	–	–	740-0	–	–	FD34-9000	–	–
	IBM Compatible (128 B/S, 26 Sectors) w/ W P N & Hub Ring	3064	2.39	–	–	–	–	–	–	–	–	–	FD34-9000	–	–
	IBM Compatible (128 B/S, 26 Sectors) REVERSIBLE	1729	3.19	473072	54431	–	–	–	FD-2	740/2-0	–	15150	FF34-9000	F171111X	–
	IBM System 6 Compatible	3066	2.04	473077	54561	800509	1669959	–	–	740-0 OS6	–	15003	FD60-9000	F116111X	–
	IBM Compatible (256 B/S, 15 Sectors)	3109	1.99	473073	–	800584	2305845	–	–	740-3600	–	15005	FD36-9000	F112111X	–
	IBM Compatible (512 B/S, 8 Sectors)	3110	1.99	473074	–	800585	1669954	–	–	–	–	15004	FD60-9000	F113111X	–
	Shugart Compatible, 32 Hard Sector	3015	1.99	470901	53802	101/1	–	FH1-32	FD-132	740-32	S/A-101	15025	FD32-9000	–	421322
	Wang Compatible, 32 Hard Sector w/Hub Ring	3087	2.49	–	54491	–	–	–	–	740-32RH	–	–	–	F37A411X	–
	CPT 8000 Compatible	3045	2.69	–	–	–	–	–	–	–	–	15226	–	–	–
Flexible Disc 1d Single-Headed Drives Double Density Media	IBM Compatible (128 B/S, 26 Sectors)	3090	2.69	474071	54568	3740/1D	–	FD1-128/M2100	FD-1D	741-0	–	–	FD34-8000	F131111X	423002
	Soft Sector (128 B/S, 26 Sectors) REVERSIBLE	3093	3.69	–	–	–	–	–	–	–	–	–	–	–	–
	Shugart Compatible, 32 Hard Sector	3091	2.69	470801	54596	101/1D	–	FH1-32D	–	741-32	S/A-103	15075	FD32-8000	F33A411X	423322
	Wang Compatible, 32 Hard Sector w/Hub Ring	3088	3.09	–	–	–	–	–	–	–	–	–	–	–	–
Flexible Disc 2s Double-Headed Drives Single-Density Media	Soft Sector (128 B/S, 26 Sectors)	3113	3.09	–	54428	800814	1766870	–	–	–	S/A-150	15153	FD10-4026	F121111X	–
	Soft Sector (256 B/S, 15 Sectors)	3106	3.09	473477	54226	800815	2736700	FD2-256D	–	742-0	–	15154	FD10-4015	F122111X	424612
Flexible Disc 2d Double-Headed Drives Double-Density Media	Soft Sector (Unformatted)	3102	3.09	473485	–	DY150	–	FD2-XDM	FD-2D	743-0	–	15103	DD34-4001	–	425002
	Soft Sector (128 B/S, 26 Sectors)	3115	3.09	–	–	–	–	–	–	–	S/A-150	–	–	–	–
	Soft Sector (256 B/S, 26 Sectors)	3103	3.09	473471	54325	800817	1766872	FD2-256D	–	743-0/256	–	15101	DD34-4026	F144111X	425602
	Soft Sector (512 B/S, 15 Sectors)	3114	3.09	473472	54479	800818	1669044	–	–	743-0/512	–	15100	DD34-4015	F145111X	425612
	Soft Sector (1024 B/S, 8 Sectors)	3104	3.09	473473	54485	800819	1669045	–	–	743-0/1024	–	15102	DD34-4008	F147111X	425622
	32 Hard Sector	3105	3.09	470851	–	101/2D	–	FH2-32D	–	743-32	S/A-151	15125	DD32-4000	F34A411X	425322
	Burroughs B-80 Compatible, 32 Hard Sector	3092	3.09	–	–	–	–	–	–	–	–	–	–	F34A611X	–
	Soft Sector (1024 B/S, 8 Sectors) w/ Hub Ring	3116	3.49	–	–	–	–	–	–	–	–	–	–	–	–
	Shugart Compatible, 32 Hard Sector	3181	3.39	–	–	–	–	–	–	–	–	–	DD32 4000		
Flexible Disc FD Memorex 651 or Equiv Drive Compatible	FD VI (Vinyl Jacket)	30712003	2.69	470651	–	FDIV	–	–	FD-165	511-0	–	15026	FD65-1000	F61A111X	–
Mini Flexible Disc 1s 5¼" Single-Headed Drives Single-Density Media	Soft Sector (Unformatted)	3401	1.94	475001	54256	104/1	–	MD1	MD 1	744-0	S/A-104	15300	MD525-01	M11A211X	441002
	10 Hard Sector	3403	1.94	475010	54257	107/1	–	–	MD 110	744-10	S/A-107	15325	MD525-10	M41A211X	441102
	16 Hard Sector	3405	1.94	475016	54258	105/1	–	MH1	MD 116	744-16	S/A-105	15326	MD525-16	M51A211X	441162
	Soft Sector (Unformatted) w/Hub Ring	3431	2.14	–	–	–	–	–	–	–	–	–	MD525-01	–	–
	10 Hard Sector, w/Hub Ring	3433	2.14	–	–	–	–	–	–	–	–	–	MD525-10	–	–
	16 Hard Sector, w/Hub Ring	3435	2.14	–	–	–	–	–	–	–	–	–	MD525-16	–	–
Mini Flexible Disc 1d 5¼" Single-Headed Drives Double-Density Media	Soft Sector (Unformatted)	3417	2.14	–	54646	104/1D	–	–	–	–	–	–	MD525-01	–	–
	10 Hard Sector	3418	2.14	–	54649	107/1D	–	–	–	–	–	–	MD525-10	–	–
	16 Hard Sector	3419	2.14	–	54652	105/1D	–	–	–	–	–	–	MD525-16	–	–
	Soft Sector (Unformatted) w/Hub Ring	3481	2.34	–	–	–	–	–	–	–	–	–	MD525-01	–	–
	10 Hard Sector w/Hub Ring	3483	2.34	–	–	–	–	–	–	–	–	–	MD525-10	–	–
	16 Hard Sector w/Hub Ring	3485	2.34	–	–	–	–	–	–	–	–	–	MD525-16	–	–
Mini Flexible Disc 2d 5¼" Double-Headed Drives Double Density Media	Soft Sector (Unformatted)	3421	2.59	–	54624	104/2D	–	–	–	–	S/A-154	–	MD550-01	–	–
	10 Hard Sector	3423	2.59	–	54627	107/2D	–	–	–	–	S/A-157	–	MD550-10	–	–
	16 Hard Sector	3425	2.59	–	54630	105/2D	–	–	–	–	S/A-155	–	MD550-16	–	–
	Soft Sector (Unformatted) w/Hub Ring	3491	2.79	–	–	–	–	–	–	–	–	–	MD550-01	–	–
	10 Hard Sector w/Hub Ring	3493	2.79	–	–	–	–	–	–	–	–	–	MD550-10	–	–
	16 Hard Sector w/Hub Ring	3495	2.79	–	–	–	–	–	–	–	–	–	MD550-16	–	–

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Memorex means quality products that you can depend on. Quality control at Memorex means starting with the best materials available. Continual surveillance throughout the entire manufacturing process. The benefit of Memorex's years of experience in magnetic media production, resulting, for instance, in proprietary coating formulations. The most sophisticated testing procedures you'll find anywhere in the business.

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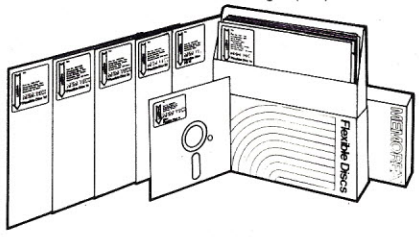
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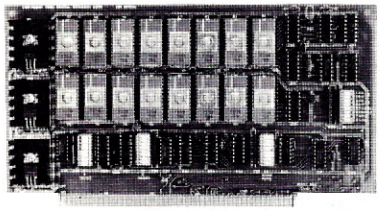
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10. Unselected EPROM's automatically powered down for low power.
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$259.95 KIT

For 2MHZ Add $10

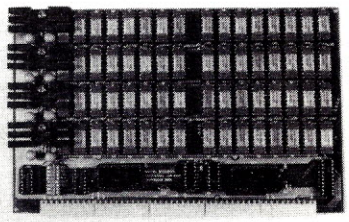
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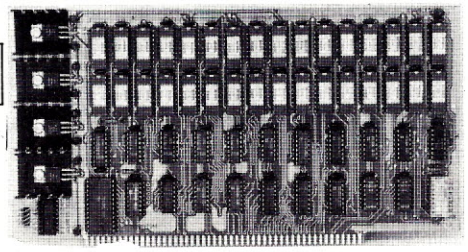
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16K STATIC RAM KIT-S 100 BUSS

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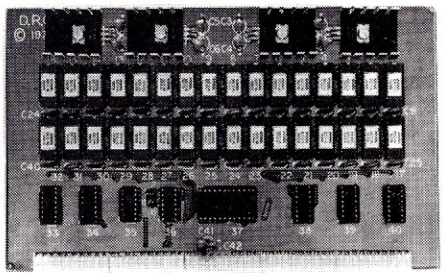
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FOR SWTPC 6800 BUSS!

ASSEMBLED AND TESTED - $35

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5. All Parts and Sockets included
6. Low Power: Under 1.5 Amps Typical

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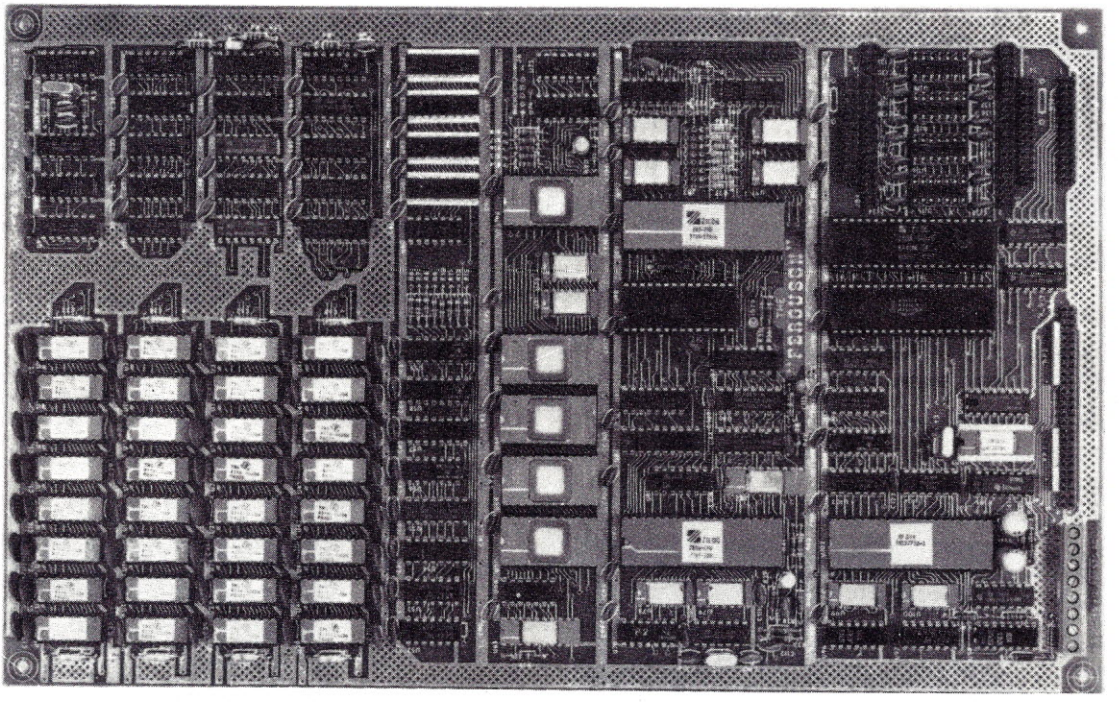
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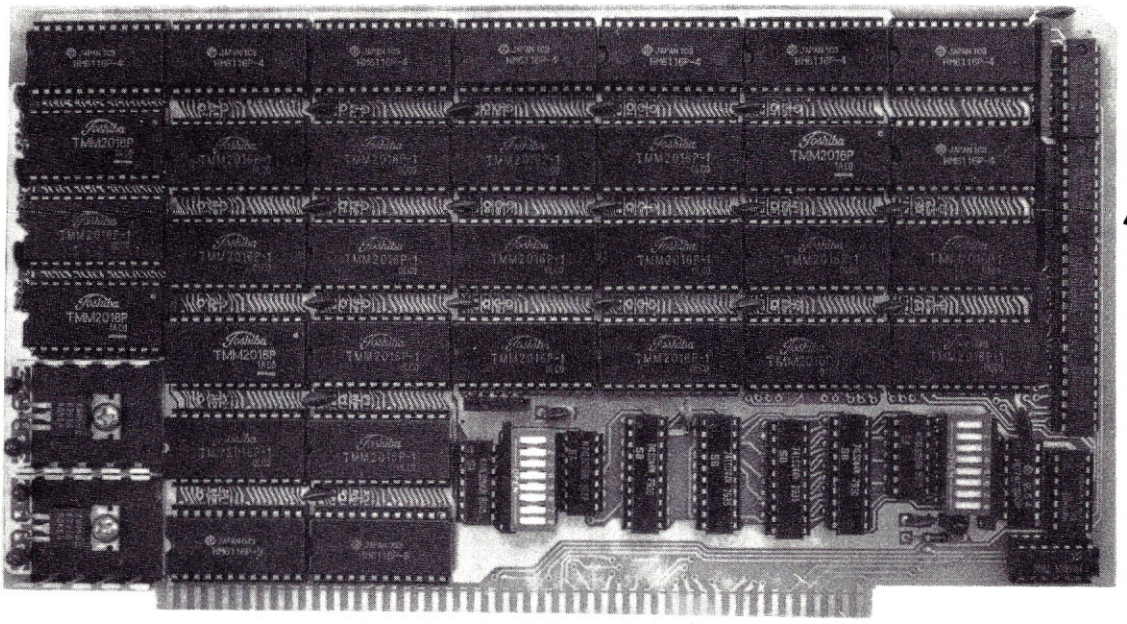
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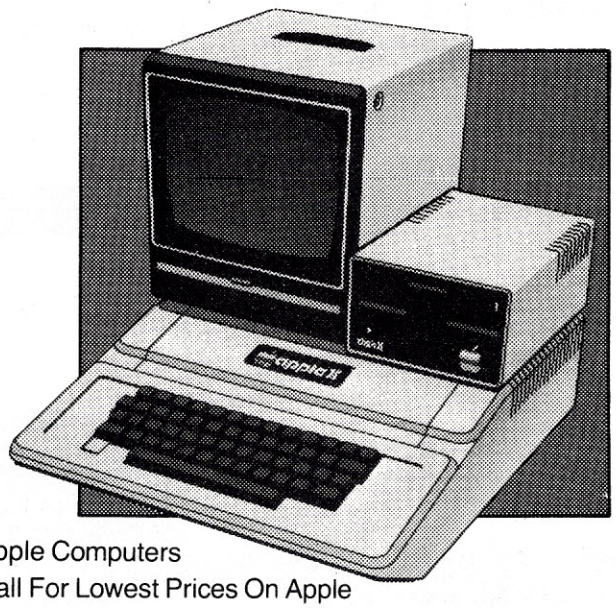
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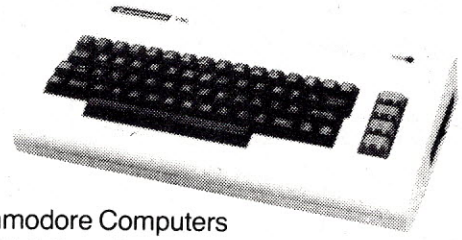
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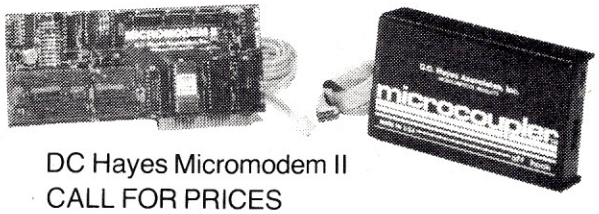
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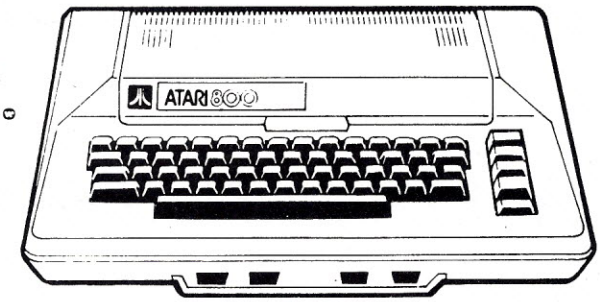


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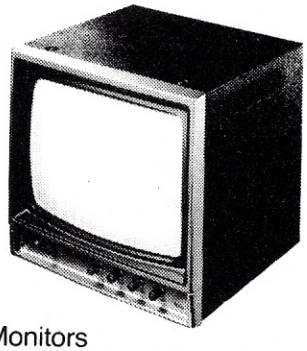


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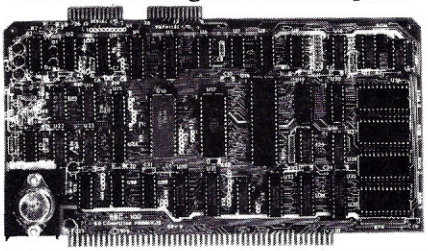
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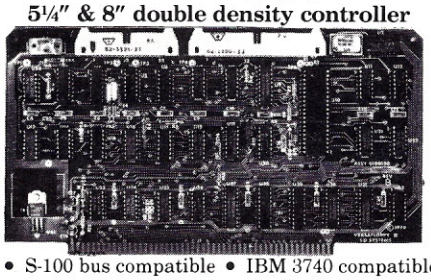
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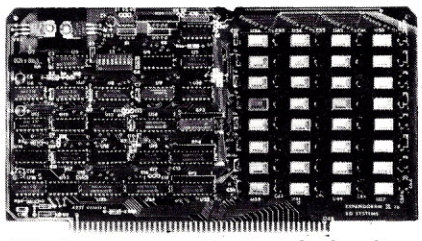
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ExpandoRAM III

64K to 256K expandable RAM board



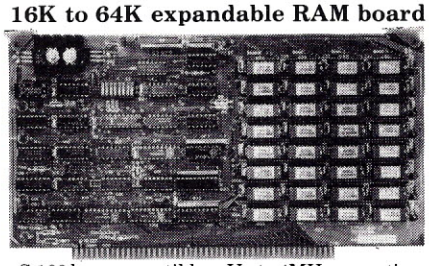
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ExpandoRAM II

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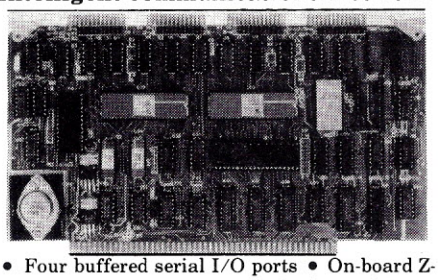
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-All boards are assembled and tested-

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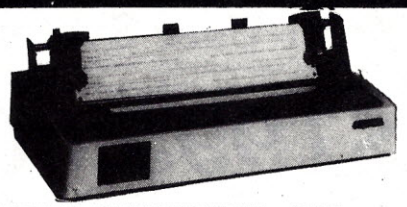
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New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CPM 2.2, Shugart & Qume compatible

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Inexpensive disk drives for your Apple

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Micro Sci Controller *Disk controller for up to two Micro Sci A40 or A70 disk drives, DOS 3.2, 3.3, Pascal, and Z-80 SoftCard compatible, includes utility disk and 40/70 track patch.*

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AIO, ASIO, APIO - S.S.M.

Parallel & serial interface for your Apple (see Byte pg 11)

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2708, 2716, 2732 EPROM programmer w/software

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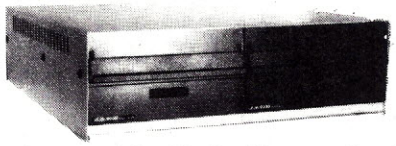
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MSM-750050 .. $359.95 ea 2 for **$349.95 ea**

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74123N	55	LM340T-15	75	CD4049	45	MM5280	3 00	4 position	85
74125N	45	LM340T-18	75	CD4050	55	MM5321	9 95	5 position	90
74145N	60	LM340T-24	75	CD4051	95	MM5330	5 94	6 position	90
74150N	1 20	LM350	5 50	CD4060	1 42	MM5369	8 95	7 position	95
74151N	65	LM377	2 29	CD4066	71	9368	3 50	8 position	95
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74221N	1 25	LM748N	50	CD4082	30	MM5865	7 95	Jumbo Red	25
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74LS174N	95	ICL7103	9 50	74C922	5 00	Z80A S10 1	23 90	FND500 507 CC CA	500 99
74LS190N	1 00	ICL7107	14 25	74C923	5 50	Z80 S10 2	23 95	FND503 510 CC CA	500 90
74LS221N	1 19			74C925	6 75	Z80A S10 2	28 95	FND800 807 CC CA	800 2 20
74LS258N	69	**CMOS**		74C926	6 95	Z80B CTC	17 95	10 digit display	1 25
74LS367N	69	CD4000	25	74C927	6 95	Z80B P10	17 95	7520 Diplex photocells	38
		CD4001	35			8212	1 85	TIL311 Hex	9 50
LINEAR		CD4002	35	**INTERFACE**		8214	3 75	MAN4610 CA	40 99
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CA3089	3 40	CD4010	45	8109	1 25	8253	8 95	MAN6710 CA	60 99
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3341	6 95

PROM

1702A	4 50
2532	17 50
2708	2 95
2716TI	8 50
2716 5 Volt	5 50
8 2716 5 Volt	39 00
2732	16 50
2758	7 49
8741A	39 95
8748	39 95
8748-8	34 95
8755A	49 95
N82S23	2 95
N82S123	3 95
N82S126	5 75
N82S129	4 75
N82S131	4 95
N82S136	8 75
N82S137	8 75
DM8577	2 90
8223	3 50

CONNECTORS

30 pin edge	2 50
44 pin edge	2 75
86 pin edge	4 00
100 pin edge	3 95
100 pin edge w/w	4 95

IC SOCKETS

Solder Tin	Low Profile		
PIN	1UP	PIN	1UP
8	13	22	30
14	14	24	30
16	16	28	40
18	20	36	58
20	29	40	49

WIRE WRAP LEVEL 3

PIN		PIN	
14	55	24	93
16	57	28	1 00
18	67	40	1 59

2 level 14 pin w-w 20

CRYSTALS

1 MHz	4 50
2 MHz	3 95
4 MHz	3 95
5 MHz	3 95
10 MHz	3 95
18 MHz	3 90
20 MHz	3 90
32 MHz	3 90
32768 Hz	4 00
1 8432 MHz	4 50
3 5795 MHz	1 20
2 0160 MHz	1 95
2 097152 MHz	3 95
2 4576 MHz	3 95
3 2768 MHz	3 95
5 0688 MHz	3 95
5 185 MHz	3 95
5 7143 MHz	3 95
6 5536 MHz	3 95
14 31818 MHz	3 95
18 432 MHz	3 95
22 1184 MHz	3 95

KEYBOARD ENCODERS

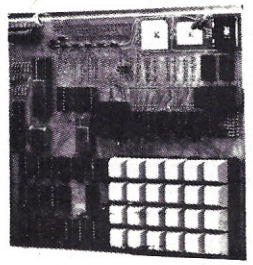
AY5-2376	11 95
AY5-3600PRO	17 95
74C922	5 49
74C923	5 50
HD0165-5	7 95

D Connectors RS232

DB25P	2 95
DB25S	3 50
Cover	1 25

4116 200ns Dynamic RAM 8/$15.40

1981 IC MASTER CLOSEOUT $59.95



RCA Cosmac 1802 Super Elf Computer $106.95

The Super Elf is a small single board computer that does many **big** things. It's an excellent computer for training and for learning programming with its machine language and yet it's easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Full documentation.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

Moews Video Graphics **$3.50,** Games and Music **$3.00,** Chip 8 Interpreter **$5.50,** Starship 4K cassette **$14.95.** Exciting and challenging space game. Complete manual included.

Free 14 page brochure of complete Super Elf system.

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range $\pm .17E^{38}$), 32 bit integer ± 2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O, save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including **renumber** and essentially **unlimited variables.** Also, an exclusive user expandable command library.

Serial and Parallel I/O routines included.

Super Basic on Cassette $55.00.

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed**. EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at **$18.95** for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply below).

ELECTRONIC SYSTEMS KITS

Apple Peripheral Kits

SERIAL I/O INTERFACE 0 to 30,000 baud, D.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only (P/N 2) **$14.95,** Kit (P/N 2A) **$51.25,** Assembled (P/N 2C) **$62.95.**

PROTOTYPING BOARD (P/N 7907) **$21.95.**

PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, Bd only (P/N 210) **$19.20,** Kit (P/N 210A) **$119.55.**

OPTO-ISOLATED INPUT BOARD 8 inputs, can be driven from TTL logic, Bd only (P/N 120) **$15.65,** Kit (P/N 120A) **$69.95.**

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & −12V required.Bd only (P/N 101) **$11.95,** Kit (P/N 101A) **$42.89.**

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) **$9.95.**

RS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) **$14.95.**

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Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$78.50** (with timer **$108.50**).

NiCad Battery Fixer/Charger Kit

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Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00.** Tiny Basic **$30.00.**

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60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

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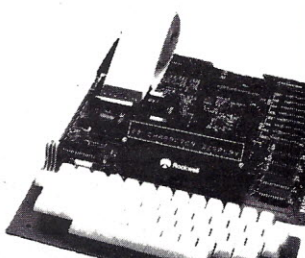
Super Monitor VI.I Source Listing $15.00

Rockwell AIM 65 Computer

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Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Super Color S-100 Video Kit $129.95

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7720B PARALLEL CENTRONICS $98.95
7811B ARITHMETIC PROCESSOR W/DISC $342.95
7811C ARITHMETIC PROCESSOR W/ROM $342.95
7500A WW BOARD $22.95
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VB3 80 CHARACTER VIDEO 4MHZ
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UPGRADE RAMS FOR VB-3 ..... $42.00
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Apple PASCAL

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See List of Advertisers on page 178

CALENDAR

University of Washington Computer Fair

The University of Washington Academic Computer Center will sponsor its eighth annual Computer Fair March 3 and 4. In addition to viewing more than 100 vendor displays, visitors can register for hands-on workshops on computer applications in manufacturing, and can attend free seminars on such topics as AT&T deregulation, use of census data, word processing and laboratory automation. The keynote address will be given by Jonathan V. Post, author of two *Omni* magazine cover articles.

For information contact Dr. Thomas Bennett, U.W. Academic Computer Center, Seattle, WA 98195. 206-543-5728.

Satellite, Microwave and Cable Systems Workshop

A three-day workshop sponsored by the University of Ottawa will be held March 10–12 in Ottawa, Canada. The workshop—Satellite, Microwave and Cable Systems—will cover modem modulation, coding and signal processing.

For more information contact Dr. K. Feher, Electrical Engineering, University of Ottawa, Ottawa, Canada K1N 6N5. 613-231-2288 or 231-2355.

Computers in Education Conference

The annual Computers in Education Conference will be held on March 12 and 13 at Seattle Pacific University, Seattle, WA. The program will include talks, workshops and exhibits with emphasis on the use of the microcomputer in K–12 classrooms.

Contact Tony Jongejan, Everett High School, 2416 Colby, Everett, WA 98201.

Eighty/Apple Computer Show

The Eighty/Apple Computer Show will be held at the NY Statler Hotel in New York City April 2 through 4. This second annual show will include over 100 commercial exhibits of hardware, software, printers, books, magazines and accessories for these two popular small computer systems. Other systems such as IBM, Sinclair and Atari will also be featured by many exhibitors.

For additional information contact: Kengore Corporation, 3001 Rte. 27, Franklin Park, NJ 08823. 201-297-2526.

California Computer Show

The California Computer Show, a single source, one-day computer show for OEMs, sophisticated end users, dealers and distributors will be held April 22 from 1–7 PM at the Hyatt Hotel, 4290 El Camino Real, Palo Alto, CA 94306.

For additional information contact Carol Reimer, c/o Norm De Nardi Enterprises, 289 S. San Antonio Rd., #204, Los Altos, CA 94022. 415-941-8440.

Moving Microcomputers into the Mainstream of Education

The workshop, Moving Microcomputers into the Mainstream of Education, will be held at the University of Victoria, Victoria, B.C., May 6–8.

For more information contact the University Extension Conference Office, University of Victoria, Victoria, B.C. V8W 2Y2. 604-721-8475.

Computer Show and Office Equipment Expositions

The New York Computer Show and Office Equipment Exposition will be held at the Nassau Coliseum in Uniondale, NY, April 22–25 from 10 AM to 6 PM.

The second annual Southwest Computer Show and Office Equipment Exposition will be held in Market Hall at the Dallas Market Center in Dallas, TX, April 15 to 18. Show hours are 10 AM to 6 PM daily.

Admission for each show is $5 for adults and $3 for children.

For further information contact National Computer Shows, 824 Boylston St., Chestnut Hill, MA 02167. 617-739-2000.

Applefest/Boston

The second Applefest/Boston will be held May 14 to 16 at Hynes Auditorium, Boston, MA. Show hours are 11 AM to 6 PM daily. The show will have over 200 displays and booths, plus seminars and panel discussions. Ticket prices are $6 per day or $15 for a three-day ticket.

Call or write National Computer Shows, 824 Boylston St., Chestnut Hill, MA 02167. 617-739-2000.

NJ Microcomputer Show and Flea Market

The third annual NJ Microcomputer Show and Flea Market will be held May 22 at the Holiday Inn (North) at the North Terminal of Newark International Airport, Newark, NJ. The event will include over 50 commercial exhibitors and 150 flea market sellers. Hardware, software and accessories for all popular systems, including Apple, TRS-80, Atari, PET, Heath/Zenith, ZX-80/81, S-100 and IBM will be for sale.

For additional information contact: Kengore Corp., 3001 Rte. 27, Franklin Park, NJ 08823. (201)-297-2526.

National Computer Conference

The National Computer Conference will be held June 7–10 at the Astrodomain, Houston, TX.

Registration must be received by May 3. To register write to NCC '82 Registration, AFIPS PO Box 9658, Arlington, VA 22209. For further information call 703-558-3608.

Computerfest '82

The Midwest Affiliation of Computer Clubs is sponsoring the seventh annual Computerfest '82, June 18–20 at Franklin University, Columbus, OH. Computerfest will include lectures, demonstrations, exhibitions and a flea market.

For more information contact M.A.C.C., c/o Professor Don Moore, 201 South Grant Ave., Columbus, OH 43215.

National Computer Camp

National Computer Camp will be held in Simsbury, CT from July 11–Aug. 16 for youngsters ages ten to 18. In addition to learning about computers, children will have an opportunity to enjoy recreational activities including swimming and tennis.

For more information contact Michael Zabinski, Ph.D., National Computer Camp, PO Box 624, Orange, CT 06477. 203-795-3049.

MICRO QUIZ

What Does This Program Do?

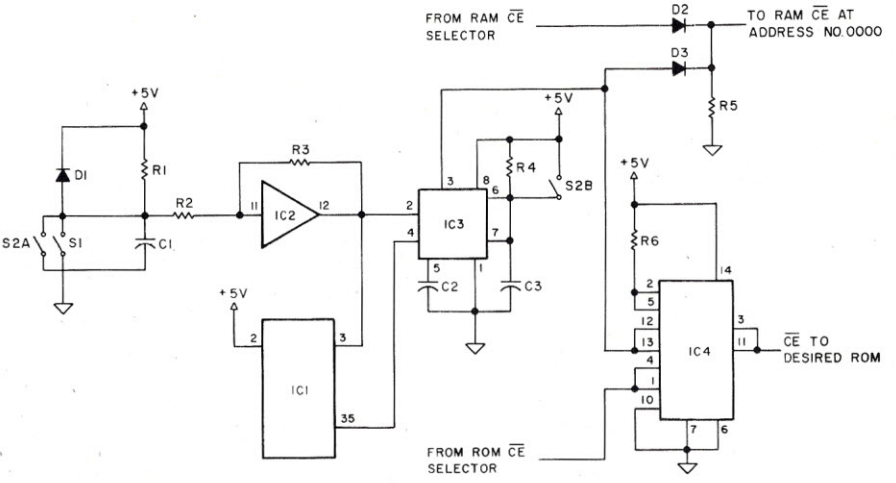
Find the values of x such that A(x) = 7 after the following program is executed.

```
FOR I = 13 TO 1 STEP -1
    A(I) = I
NEXT I
FOR J = 1 TO 13
    T = A(J): A(J) = A(-J+14):
    A(14-J) = -T
NEXT J
```

(answer on page 175)

CORRECTIONS

The following circuit should have accompanied the "Power Jump for the 1802" article, which was published in the January 1982 issue of *Microcomputing*.



A typographical error popped up in the January Micro Quiz column. The first line of the program should read L$ = "you".

CLUB NOTES

Long Island Computer Association

The Long Island Computer Association is open to anyone, amateur or professional, interested in computers, applications or programming. Dues are $10 per year and membership includes the monthly publication, The Stack.

For further information contact the Long Island Computer Association, 3788 Windsor Drive, Bethpage, NY 11714.

Pittsburgh HUG

The Pittsburgh, PA, local HUG group meets the third Thursday of every month at the Heathkit store from 7 PM to 9 PM. 412-824-3564.

New England Apple Tree

New England Apple Tree is an Apple user's group that meets the third Wednesday of the month. The group also publishes a monthly newsletter, N.E.A.T. Notes. For more information contact New England Apple Tree, Box 2652, Woburn, MA 01801.

South Eastern Michigan Computer Organization

The South Eastern Michigan Computer Organization meets the second Sunday of the month at the Ford Automotive Safety Center Auditorium in Detroit, MI at 7 PM.

For further information contact S.E.M.C.O., PO Box 02426, Detroit, MI 48202.

Amateur Computer Group of New Jersey

Membership in the Amateur Computer Group of New Jersey includes a subscription to the monthly newsletter, the ACG-News. Membership applications should be sent to Amateur Computer Group of New Jersey, c/o UCTI, 1776 Raritan Road, Scotch Plains, NJ 07076.

Please submit club notices to Club Notes, Microcomputing, Pine St., Peterborough, NH 03458. Copy must be received by the 25th of the month, three months prior to publication (i.e., notices to appear in the May issue must be received by Feb. 25).

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to: **Classifieds, *Microcomputing*, Peterborough, NH 03458**. Do not include any other material with your ad as it may be delayed.

New Atari equipment for sale: Atari 800 computers, $730 each, some software included. Two Atari 810 disk drives, $505 each; one Atari 820 printer, $420; Atari 16K RAMs; Atari 8K RAMs; Atari joysticks; Atari paddles. Contact Matt Smith, 603-924-9471.

Hewlett-Packard HP-85, 6 months old, loaded with I/O ROM, plot/printer ROM 32K RAM, serial interface, Visicalc+, TextEd and carrying case. Retailing at $4915 (discount value $4285). SAVE! $2995. U SHIP! V. M. Faulkner, R.R. 2, Box 294-A, Yorktown, IN 47396. 317-289-4138.

For sale: TRS-80 level II 16K computer. Includes Exatron stringy-floppy RS-232 interface and $300 worth of software. All documentation, etc. New condition. $1000. Call 404-232-4600 evngs.

For sale: Diablo hytype I mod 1200 daisywheel printer, pin and friction feeds, ksr cover, 2 sets spare parts, all documentation. $450. 404-232-4600 evenings.

Wanted: Assembly manual and/or schematic for Imsai CPA Rev 4, front panel. Board circa 1977. Will cover duplication, shipping. T. Janusiak, Box 411, So. Milwaukee, WI 53172.

TRS-80 user's group gives FREE sample newsletter. Reviews programs right for YOUR needs. Avoid ripoffs. Sent 37¢ stamped SASE. Software Review(TM), 92 Washington Ave., Cedarhurst, NY 11515.

IBM 2970 Selectric I/O computer terminal $325, 35 Teletype $60. Call 608-582-4124 for Kurt.

For sale: 24K Atari 800 w/810 disk. DOS 1 plus extra diskette in three-ring binder with vinyl diskette holders. Basic, Super Breakout, Star Raider cartridges. RF adapter, two joysticks, set of paddles. All support documentation plus Atari's newsletters. $1300 or best offer. Cliff Fuhrmann, 1833 35th St. N.W., Rochester, MN 55901. 507-286-1842.

FREE machine-language monitor for Elf II. Does all that the Netronics monitor does plus more and uses the terminal, not the hex keypad. Runs in 1.25K and can run from a PROM. Has a 300 baud software UART and a parallel printer out routine. Please send name and address with $2 to cover reproduction and mailing to: John Ware, 2257 6th Ave., Ft. Worth, TX 76110.

LETTERS TO THE EDITOR

Taxing Questions

In the November 1981 issue (p. 242) Hoy Quan says Ms. C can't deduct the total $5000 cost in the first year.

In *Personal Computing* (Nov. 1981, p. 20) the author says the first $5000 of business equipment is expenseable in the first year.

Who is right?

James W. Cox
Springfield, OR

Response:

Since my article, "The IRS and You," was published in the November issue of *Microcomputing*, I have noticed several other articles and ads which deal with taxes and computers. As a postscript, I would like to warn readers of some potentially misleading claims made by those writers.

Creative Computing, December 1981, p. 65, Microlab ad.

Statement: "Buy the Tax Manager and turn your Apple into a tax deduction."

Fact: You can deduct computer tax preparation expenses only if you itemize. If you are using the short form, you cannot deduct a single penny for tax preparation expenses.

Fact: You may only deduct a reasonable amount of the total computer expense. Don't try to deduct the entire system as a tax preparation expense if you have a small return! If your normal tax preparation expense is $50, the IRS will not allow you to deduct $5000 just because you are doing it on a computer. If you do, plan on having your return audited and paying interest and penalty charges.

Personal Computing, December 1981, p. 55, "Voice of the IRS: Can Computers be Deducted?"

Statement: "Another provision of the new laws provides for the deduction of the first $5000 of business equipment purchased in 1982 and 1983. Thus, computer systems purchased during these years could be fully expensed in the same year, but no investment credit is permitted on these purchases."

Response: If you need a large deduction, the new tax laws allow you to deduct $5000 in the first year, but remember, you lose the investment tax credit. That can mean a loss of up to $500.You can still distribute the $5000 deduction over several years and in some cases it may be best to use the deduction when you have a larger income in future years. I originally stated that the full cost of the system cannot be deducted in the first year; it still applies to equipment purchases made prior to 1982.

Statement: "To reduce the chance of an audit, enclose a brief description with your return of what the computer does for your occupation and how it helps increase or maintain your present skills and income."

Response: Don't enclose any additional information! A general rule used by knowledgeable tax preparers is: Never give the IRS any more information than they ask for. A statement of use may reduce the chance of an audit but if it is improperly prepared, it may provide the IRS with information to disallow your deduction. Unless you know the tax laws, have your tax counsel prepare the statement and only *after* you have been called for an audit. Each preparer has his own opinion on this matter; I advise my clients to enclose only what is absolutely necessary.

Statement: "In addition to these aids, phone-directory programs, inventory calculation software, database management programs, payroll, accounts receivable and accounts payable software can also be used to help in qualifying for computer-related tax relief."

Response: True, but spending more money on software will not by itself qualify you for a deduction. Documenting the use of your system is your best defense against an audit. A writer can qualify his system simply with a word processor program provided that he can prove that he is a writer by trade. Don't make the software vendors rich in your attempt to please the IRS.

Hoy Quan
Montebello, CA

New Tax Incentives

The Economic Recovery Tax Act of 1981 provides incentives for businesses to purchase equipment such as microcomputers, and even more important to the growing cottage industry of software and hardware developers, the new law provides significant tax deductions and credits to develop new computer products.

One of the tax breaks for small businesses is the deduction of the entire cost of a small business system up to $5000 if placed in service in 1982 and 1983, up to $7500 in 1984 and 1985, and $10,000 each year after 1985. For research expenditures paid or incurred after June 30, 1981, a tax credit of 25 percent of such expenses is available subject to a maximum limitation discussed further on in this letter.

The new tax act gives computer-oriented businesses an option for recovering the cost of the computer equipment. The alternative to deducting the entire $5000 in 1982 is to depreciate the expenditure over a five year period. Although this option reduces your deduction in the year of purchase, you can claim a ten percent investment tax credit. In some cases, where you expect to be in a higher tax bracket in later years, the depreciation deduction under the accelerated cost recovery system combined with the ten percent investment tax credit may be the better option.

The new law provides incentives to businesses to increase their research and development expenditures by allowing for rapid depreciation of research equipment. Businesses can deduct the cost of such equipment over a three year period—25 percent in the year of purchase and 38 percent and 37 percent in the subsequent two years. The law also provides a tax credit of 25 percent of incremental research expenses.

The research deductions and credits apply if you are starting a new business, or significantly improving an existing product, such as a new mailing list program, and are incurring additional qualifying expenses compared to a previous base period. The key word here is *additional* because the 25 percent tax credit is based on the increase in your qualifying expenditures.

The rules for qualifying for the research credit are a bit complicated but here is the general idea: Assume that your qualifying research expenses for the year total $10,000 and it was $6,000 in a prior year. The research credit is 25 percent of the incremental $4,000 of expenses, or $1,000.

You should be aware of what constitutes "qualified research expenses." These expenses include wages paid for research services, amounts paid for sup-

Applesoft Version Of Integer BASIC

I have had a number of requests for an Applesoft version of my Integer Basic program for dumping the Apple hi-res screen to a Diablo printer (*Microcomputing*, Nov. 1980, p. 100). Because of all the bit manipulation involved in a screen dump, Applesoft is considerably slower than Integer Basic, but I have managed to speed up the program considerably by using the Absolute Tab function of the Diablo. The Applesoft version is given in Listing 4.

The main modifications to the original program are: the use of the standard CHR$ function of Applesoft (had to be simulated in Integer Basic); the use of an arithmetic expression to simulate the MOD function (since MOD is not available in Appplesoft); and the addition of the Absolute Tab subroutine at lines 600–700. As tested in line 406, if spacing must be more than ten positions before printing, then the Absolute Tab function is called, which moves the printhead directly to the next location to be printed. Since in most screen dumps a considerable amount of white is being printed, spacing over with the Absolute Tab rather than with the direct use of the space character greatly speeds up printing. (Actually, the same routine can be used to speed up the Integer Basic version as well.)

This Applesoft version should be of use to all Apple II+ owners who lack a language card and hence do not have Integer Basic available.

Thomas D. Brock
Madison, WI

```
11  INPUT "PAGE 1 OR 2";D
12  IF D = 1 THEN  GOTO 14
13 START = 16384: GOTO 20
14 START = 8192
20  INPUT "PRINTER SLOT #? ";N
25  PR# N: PRINT " ";
30 C9$ = "."":SP$ = " "
70 E$ =  CHR$ (27):US$ =  CHR$ (31):RS$ =  CHR$ (30):HT$ =  CHR$ (9):LF$ =
      CHR$ (10):BS$ =  CHR$ (8)
75 AS$ =  CHR$ (1):AU$ =  CHR$ (2):VT$ =  CHR$ (11)
80  PRINT E$;US$; CHR$ (5);
90  PRINT E$;RS$; CHR$ (3);
95  PRINT E$;HT$;AS$;LF$;
100  FOR Y = 0 TO 191
110 A =  INT (Y / 64)
120 Y1 =  INT ((Y / 64 -  INT (Y / 64)) * 64 + .05) *  SGN (Y / 64)
130 B =  INT (Y1 / 8)
140 C =  INT ((Y1 / 8 -  INT (Y1 / 8)) * 8 + .05) *  SGN (Y1 / 8)
150 P = START + (A * 40) + (B * 128) + (C * 1024)
160 X9 = 0:H9 = 0
170  FOR X = 0 TO 39
180 R =  PEEK (P + X)
185  IF R = 0 THEN X9 = X9 + 7
186  IF R = 0 THEN  GOTO 260
190 I = 0
200 R3 =  INT ((R / 2 -  INT (R / 2)) * 2 + .05) *  SGN (R / 2)
210  IF R3 <  > 0 THEN  GOSUB 400
220 X9 = X9 + 1
230 R =  INT (R / 2)
240 I = I + 1
250  IF I < 7 THEN  GOTO 200
260  NEXT X
270  PRINT E$;HT$;AS$;
280  PRINT LF$;
290  NEXT Y
300  END
400 N9 = X9 - H9
402 H9 = H9 + N9
405  IF N9 = 0 THEN  RETURN
406  IF N9 > 10 THEN  GOSUB 600
410  FOR J9 = 1 TO N9
420  PRINT SP$;
430  NEXT J9
450  PRINT C9$;
460  PRINT BS$;
470  RETURN
600 N9 = 1:HM = 4:H8 = H9
605  IF H9 <  = 126 THEN  GOTO 720
610  IF  INT ((H8 / 2 -  INT (H8 / 2)) * 2 + .05) *  SGN (H8 / 2) = 0 THEN
      GOTO 625
620 H8 = H8 - 1:N9 = N9 + 1
625 H8 =  INT (H8 / 2)
630 HM =  INT (HM * 2)
640  IF H8 <  = 125 THEN  GOTO 700
660  IF  INT ((H8 / 2 -  INT (H8 / 2)) * 2 + .05) *  SGN (H8 / 2) = 0 THEN
      GOTO 625
670 H8 = H8 - 1:N9 = N9 + 2
680  GOTO 625
700 HM = HM + 1
710  PRINT E$;US$; CHR$ (HM);
720  PRINT E$;HT$; CHR$ (H8);
730  PRINT E$;US$; CHR$ (5);
740  RETURN
```

Listing 4. Applesoft Basic screen-dump program.

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By Walter Koetke

Ongoing Search For Software

Market's Potential Untapped

Educational Software

Has educational software improved substantially during the past 12 months? Is it likely to improve dramatically during the next 12 months? Although the nature of the software retailer is undergoing significant change, educational software is progressing very slowly. The last 12 months have not released a plethora of sound educational material, and I suggest the dam is not likely to burst in the next 12 months either.

The future impact of microcomputers on instruction was discussed in this column in January. The emphasis in that column was microcomputer hardware. This month we will continue to explore the same issue with an emphasis on software.

Problems

The most significant difficulties with educational software are the unrealistic expectations of the general public as well as of many educators. The personal computers of today and the near future are just that—"personal" computers. They are marvelously effective tools in many application areas, including education, for the creative, innovative individual. They are critical in learning programming. They have had some excellent turn-key programs such as VisiCalc and WordStar written for them. And they've had a rather lengthy list of turn-key recreational software developed for them.

But most recreational software is of marginal instructional value. And the best of the turn-key software is written for the already educated. Certainly VisiCalc belongs in every high school accounting course, but without an innovative individual teaching the course the results will be mixed at best. And I strongly believe that word processing should be a student tool at the elementary level, but not with WordStar. While I agree with Seymour Papert's assertion that students should have professional tools, today's word processors require an awfully creative teacher if they're to be useful in third grade. These comments are not intended to detract from VisiCalc or WordStar; both are excellent products eminently suited for their intended marketplace.

Address correspondence to Walter Koetke, Putnam/Northern Westchester BOCES, Yorktown Heights, NY 10598.

The most significant educational software available is Texas Instruments Logo and Logo for the Apple.

Consider the use of one of the better turn-key programs, say VisiCalc, in the hands of a creative accounting teacher. How much of an impact will use of this program in this high school accounting class have on the K–12 education of each class member? My point is that educators at all levels are now searching for appropriate software. The need is incredibly large, the supply miniscule. Programs like VisiCalc can indeed enhance education, but many more are needed. As the capability of the microcomputer increases, as the number of programmers increases, and as educators gain experience with the application of this new technology, there will be many excellent instructional programs, but that will not happen quickly. You can only hope that educators do not view the majority of today's "instructional" software as valid examples of the microcomputer's educational potential.

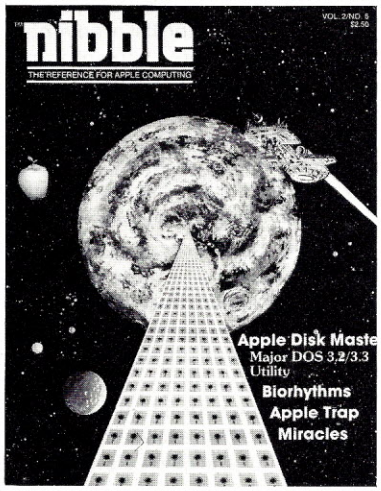
Quite likely the most significant educational software available is Texas Instruments Logo, and Logo for the Apple, from both Terrapin and Krell Software. Logo underscores several important realities of instructional microcomputing. The language was being developed many years before microcomputers were even a laboratory reality. Developing significant software takes significant time. Logo is a language to be used by children. The language encourages experimentation, innovation and individualization. You don't look for programs written in Logo to be used with children; you provide children with computing facilities on which they can write their own programs using Logo. The children use the microcomputer as a personal learning tool.

Contrary to many popular press descriptions, there are now fewer sources of software than there were a year ago. Count the ads placed by software developers in any year-old computer journal, then do the same using a current issue. The current issue will likely have notably fewer ads. On the other hand, make the same comparison for software middlemen—your "one-stop" shopping source and discount center—and you'll likely find that the current issue reflects a notable increase.

Unfortunately, with the exit of many smaller software developers there was an exit of a great deal of creativity and imagination from the ranks of those producing instructional software. There are a variety of reasons for this exit, and every case is unique. In general, however, most can likely be categorized under headings such as insufficient capital, lack of knowledge regarding sound business practices, inability to enforce copyrights or lack of cooperation from hardware manufacturers. Although I wish them every success in their business plan, I often wonder just how many software middlemen all selling the same material can be supported by the present and near future marketplace.

There are few major educational publishers who haven't already or aren't soon planning to enter the marketplace of microcomputer software. Unfortunate-

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ly, many of these traditional suppliers are doing little more than acting as middlemen. They are simply handling software already available from other sources. I expect several of these publishers aware of capital requirements and with good track records will be successful. They also have their established access to the educational market, and that is indeed a valuable asset.

When you are playing the role of the consumer, be sure you don't assume that material from the traditional publishers is better than that produced by the newer, smaller firms. While some have produced excellent material, others have generated software that can only be described as ludicrous. Can you imagine anything less useful than a program intended to help preschoolers with letter recognition that clearly assumes its users can read? This type of nonsense reflects a desire to enter the marketplace as fast as possible with little regard for quality or appropriateness. Unfortunately, when major publishers produce such garbage they are actually diminishing their market by alienating nearly every educator whose money is wasted on this early material.

Educational Suppliers

One of the more interesting market approaches taken by the traditional publishers has been that of Borg Warner. As of this writing, they have only two software products actually available, with a third one announced but unreleased. Their available packages, Critical Reading and College Entrance Examination Preparation, are probably the best software available from a traditional educational supplier. Borg Warner has obviously placed the need for quality far above the need for quantity or speed as their software is produced.

If you haven't seen the Borg Warner software, you ought to make a point of previewing it. You'll find that it is educationally sound and that it uses the microcomputer to do things that can't be realistically done another way. For example, when a student uses the "testing" mode of the College Board program, the analyses of his responses include a right/wrong distribution broken down by the time taken to answer each question. One student may learn that his accuracy does not improve when he spends a long time on a question while another student may learn just the opposite. These two students should be advised to approach the College Board Examinations in different ways. This kind of data simply isn't obtainable in any other fashion. Test-taking platitudes like "always take your time with each question" simply aren't valid for many students. The Borg Warner packages have other exemplary features, but you'll see them when you preview the software.

Both Atari and TI seem to share the viewpoint that quality educational software will sell hardware.

The most productive source of worthwhile instructional software continues to be MECC, the Minnesota Educational Computing Consortium. The best of their Apple software is now being carried by several major software distributors. As noted in the January column, Atari has contracted with MECC to rewrite the majority of this software so it will run on both the Atari 400 and Atari 800—a very smart marketing move for a company interested in quickly penetrating the educational marketplace. And not long ago Texas Instruments purchased the rights to rewrite the MECC software to run on their microcomputer. Both Atari and TI seem to share the viewpoint that quality educational software will sell hardware. I believe they're right. If Radio Shack doesn't realize this soon, their predominance in the educational marketplace is likely to disappear.

One major concern of every software producer has to be copyright protection. Several years ago an Internal Revenue Service auditor told me that the chances of IRS auditing a teacher were almost zero. As a group, teachers were considered among the most honest people in the country. I have no insight as to the current status of teachers as viewed by the IRS, but as a group I believe teachers are flagrantly violating the copyright laws. In the short term they are no doubt acquiring considerable software at very little cost. In the long term they will have a severe negative impact on a fledgling industry. Copying software seems certain to reduce the speed and quality of valid instructional software development.

Software producers are addressing the issue of copyright protection in several different ways. CUE, Computer Using Educators, in California, has produced a variety of public domain software. Their software packages contain just what you might expect—several clinkers, a few gems and lots in between. CUE has also issued a position statement in which they urge that educators not purchase software that cannot be copied. Unfortunately, this position appears somewhat naive in that it is based largely on the assumption that educators will not make illegal copies, and that simply isn't the case. As I have the opportunity to visit different schools in the country, I'm developing a theory that with only a few exceptions, the only teachers not making illegal copies of programs are those that don't know how.

When Scott, Foresman and Co. was still in the planning stage of software development, their highest priority appeared to be producing material that couldn't be duplicated. As a result they chose the TI 99/4 microcomputer, as this was then the only general-purpose machine that would accept ROM packs. At the time this decision was made, I made a list of the advantages and disadvantages of this hardware selection. The list of disadvantages was and still is rather lengthy; the list of advantages contained little more than software protection. With the present advantage of hindsight, I now feel the Scott, Foresman planners reflected a good deal of wisdom when they made their choice since ROM packs now appear to be the only way to provide adequate software protection.

While ROM packs have a few advantages over disks as a storage medium, and while ROM packs are certainly an appropriate vehicle for distributing languages such as Logo, I still find the ROM delivery of drill and practice programs and other simple instructional material personally offensive. The software is indeed protected, but the ROM also eliminates not only teacher creativity but also teacher thought. Teachers must use the ROM pack with no change or personalization, or not at all. That is standardization, not individualization, which is the forte of microcomputer use. Perhaps when a teacher can select from 10,000 ROM packs, this charge will be far less valid, but at present the ROM packs have virtually no educational advantage. Perhaps my objection to the ROM packs is overreactive, but when I view them from an educational point of view, the ROM packs seem to carry the label "produced on the assumption that there's no way to underestimate a teacher."

Other companies have approached the problem of software protection differently. Worth noting is SRA's (Science Research Associates') four page "Agreement for SRA licensed courseware." If you haven't seen this document, you're missing an attorney's delight. SRA's little agreement is likely longer than your house mortgage and, in my opinion, considerably more one-sided. Did you know that signing the agreement prevents teachers from demonstrating any portion of the software as part of a professional presentation at a regional or national meeting? Should any taxes result from the agreement, guess who pays them? And guess who does not warrant that the software will operate without error or that program defects will be corrected? SRA is not responsible for failure to fulfill its obligations due to causes beyond its control, but you aren't given a similar out. I wonder what happens if someone steals the software from you? And there's lots more.

You really ought to get a copy, but please don't ever sign one. In my opinion, this contract is an insult to the intelligence of every person from whom SRA requests a signature. On the positive side, I certainly hope the SRA legal department develops a far more reasonable approach to the problem of software protection. The SRA instructional software is really rather good and should be in the hands of many more students.

Yet another approach to solving the problem was that taken in late 1981 by Microsoft. This one seems so outrageous that my first reaction was that a software company producing such quality material wouldn't even consider such a policy. I was wrong. Should you purchase a software product from Microsoft, say Microsoft Basic, and later want that software updated, you must return the original disk for updating. Quite reasonable. But you must also return all the original documentation or you will not receive the updated software. In my opinion, completely ridiculous. When asked how to deal with salaried programmers who would be without manuals for two weeks, they politely responded that this was indeed a problem for many customers. When asked if they would ever take all documentation from their programmers for an extended period, they didn't know. And when asked if they felt their policy was reasonable, they would only say that was their policy. Once again I hope a corporation producing quality software can find a more reasonable solution to their concern for software protection. Until they do, they've probably done their competition a great favor by alienating many customers.

I'd like to reiterate that while I obviously object to several of the interim solutions offered by the corporations discussed, the problem of software piracy is very real and their concerns are very well founded. Their present solutions are likely symptoms of a very young industry finding its legs. Although computer software has been available for 20 years, only very recently have the problems of dealing with the general public rather than computing professionals come to the software developers. Let's all work toward finding an equitable solution. And in the meantime, don't make illegal copies of software and suggest the same action to those who are doing so.

The old saying that "from order comes chaos" is likely valid. However, instructional software is still in the chaos stage, and will probably remain in that state for the next year or more. The major problem of software protection must be solved and both educators and the general public must realize the realities of microcomputer software development. One piece of good instructional software takes time. Software to support a substantial portion of the K–12 curriculum will require several years to develop.□

MICRO QUIZ

(from page 167)

Answer:

After the first FOR – NEXT loop, A(i) = i, for 1< =i< = 13.

The second loop is more interesting:

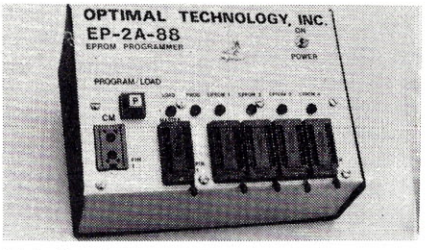
J = 1 => A(1) = 13, A(13) = – 1
J = 2 => A(2) = 12, A(12) = – 2
.
.
.
J = 6 => A(6) = 8, A(8) = – 6
J = 7 => A(7) = 7, A(7) = – 7
J = 8 => A(8) = 8, A(6) = – (– 6) = 6
.
.
.
J = 13 => A(13) = 13, A(1) = – (– 1) = 1

Since no elements of A are equal to a positive seven, x is null.

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By Eric Maloney

Processed Words

Choose Your Writing Tool Carefully

Last summer at a lyceum here in Peterborough, someone in the audience asked author Rosellen Brown whether she used a microcomputer for word processing. Her answer was "no"; she did not use a word processor, and she had no intention of trying one. In fact, she said, she didn't even use a typewriter, preferring the traditional pen and pad.

She went on to elaborate that it couldn't be just any pen or paper. The pen had to fit comfortably, and it couldn't be a ballpoint (although some felt-tips were acceptable). The paper had to be a certain size, color and texture.

Otherwise, the words simply didn't flow the way they were supposed to.

I relate this anecdote not to make a point that paper and pencil are better than keyboard and disk. Rather, I think Brown's attitude reflects a belief that the tool you use to say something affects how you say it, just as the saw a woodworker chooses helps determine the look of his crafts.

To a writer, the process of writing is as critical as the product. The words swirl around him like a host of phantasms, and somehow he's got to snatch these wisps of thought from the air and give them flesh. He's as finicky as Morris the cat about the time of day he writes, where he writes, the surface he writes on, the lighting and his beverage. He develops little routines which must be followed religiously if he is to be productive. (I, for instance, always write my first paragraph and then go to the bathroom.) Disruptions of any kind can turn him into a snarling, frothing maniac.

A word processor can have an enormous impact on how a writer approaches his work. I don't mean simply that it can make him faster or more efficient. I'm referring instead to how it reshapes words. A writer hears a phrase in his head, and uses his writing tool to amplify the sound. The sound that emerges from a pen as it rolls onto a piece of paper is different from the one produced by blinking phosphors on a cathode ray tube. With pen and paper, one can see the lines slowly trace the phrase and its image; the sound is deep and resonant. On the video screen, the words burst forth in little explosions of light; the sound is high-pitched and well-defined. It's the difference between the acoustic richness of John Coltrane's saxophone and the electric sear of Jimi Hendrix' guitar.

Much depends, of course, on the idiosyncrasies of the writer. There are undoubtedly technical writers who prefer pen and paper, and poets who opt for a word processor. But I'm willing to bet that both are in the minority. Parchment and processor are different tools for different kinds of writing.

Some computer groupies will argue that once everyone is exposed during childhood to microcomputers, all writers will use word processors. Their advantages are obvious—they're faster and more efficient. But many writers have eschewed the typewriter (which at least is faster than handwriting), and many future writers will eschew the microcomputer. For, once you get outside the worlds of business and academia, you find that speed and efficiency are not all things to all people. Some will always prefer to view the world from a tree stump on the edge of a meadow rather than through the window of a thundering jet.

So as we move into this self-proclaimed age of telecommunications, let us praise the virtues of pen and pad. And let us hope that the Rosellen Browns of literature are never compelled by the technological imperative to stare bleakly into the dark well of a VDT screen. That well should not become our only vision of the world.

*****

We've all read the predictions of how word processing is going to revolutionize (there's that awful word again) the business office. But how will it affect writing? Will we see a rise in literacy and a subsequent increase in quality reading material? Or will word processors simply let hack writers crank out twice as much junk in half the time? Will the academic world be buried beneath mile-high piles of word-processed scholarly dissertations and theses?

If you've got any reflections on the matter, drop me a line. It's a neglected, but important, topic, and one worth exploring further.

*****

Speaking of acronyms (computerists are always speaking of, or in, acronyms), *Electronic Design* magazine published in its Dec. 10, 1981, issue a sampling of acronyms designating current software packages, languages, hardware designs and the like. I could be a CRITIC, but to my DELIGHT I found that ALERT computerists are ABLE to DRAW upon their imaginations to invent acronyms in a SNAP. Sometimes they MIMIC another acronym or SPLICE a couple together; other times they simply ADLIB a name. It's simple—you come up with an IMAGE, give it a TWIST, and PRESTO! As SLIC as goose down.

Well, I'm getting hungry. I'm supposed to have dinner with ALICE, DIANA, SAM, HAL, SARA and SIBYL. We're having CAESAR's salad, CABBAGE, SPUDS and a PIGLET, which sounds pretty PROMISing to me.

*****

Readers will perhaps notice that, beginning with this issue, *Microcomputing* is making a major style change concerning the spelling of computer languages. From now on, BASIC is Basic, FORTRAN is Fortran and COBOL is Cobol. Other languages to be upper/lowercased include Algol, Lisp, Logo, Forth and Ada. (The last three, by the way, are not acronyms and should never have been all capital letters in the first place. But computerists, as we know, are a cap-happy group.) Bear with us if you notice any inconsistencies; it might take us a

couple of issues to make the complete switch.

Also, you'll notice that the tiny little *Kilobaud* no longer adorns our logo. Some of our charter subscribers will no doubt be sad to see it go—they'll remember the first two years, when we were *Kilobaud*, "The Computer Hobbyist Magazine" (later "The Small Computer Magazine").

Microcomputing crept onto the cover to grab equal billing in January 1979, and only two months later became top dog. *Kilobaud* has slowly shrunk in size, and we've finally decided to administer the coup de grace.

The reason for the final purging of *Kilobaud* is obvious—it's an outdated term which few people use any more (no one here can remember the last time it appeared between these covers). But also, it's a technical term which we think will intimidate beginning (and perhaps intermediate) microcomputerists who might otherwise find the material here to be both understandable and useful.

So goodbye, kilobaud. We're stripping you of your capital K and your italicized print. Here's 12 bucks and a suit—write when you get work.□

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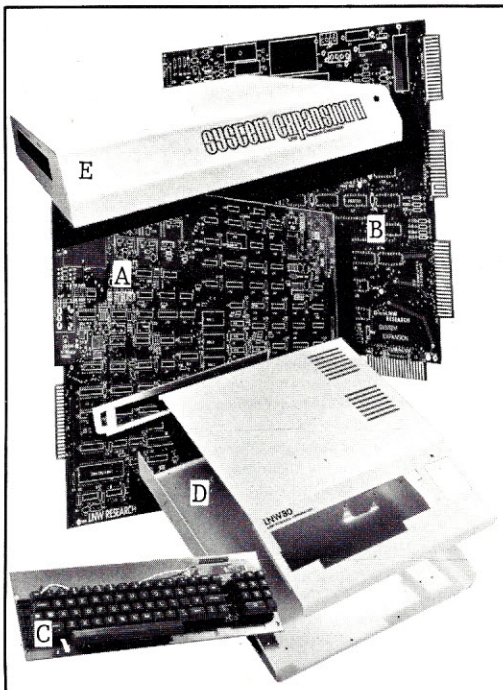


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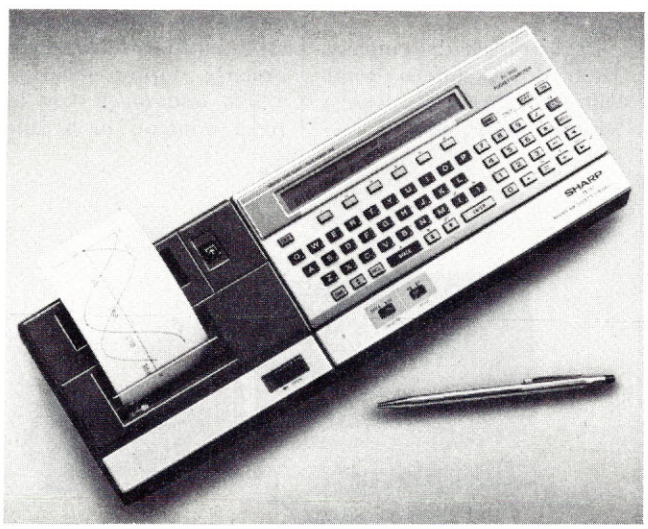
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The Sharp PC-1500 system features a 7 × 156 programmable, dot-matrix liquid crystal display, and an extended Basic that handles two-dimensional arrays, variable string lengths, program chaining, full graphics commands and other functions. The PC-1500 has 16K bytes of system ROM and 2.6K bytes (optionally expandable to 6.6K) of user-available RAM. The unit generates upper/lowercase characters and provides user-definable function keys. The optional printer provides four-color graphics, nine character sizes, bidirectional line feed and x,y plotting. The printer also incorporates a dual cassette interface for program and data storage/retrieval. The PC-1500 costs $300; optional CE-150 printer is $250; the 4K-byte RAM expansion costs $75.

Sharp Electronics Corp., 10 Sharp Plaza, Paramus, NJ 07652. Reader Service number 464.

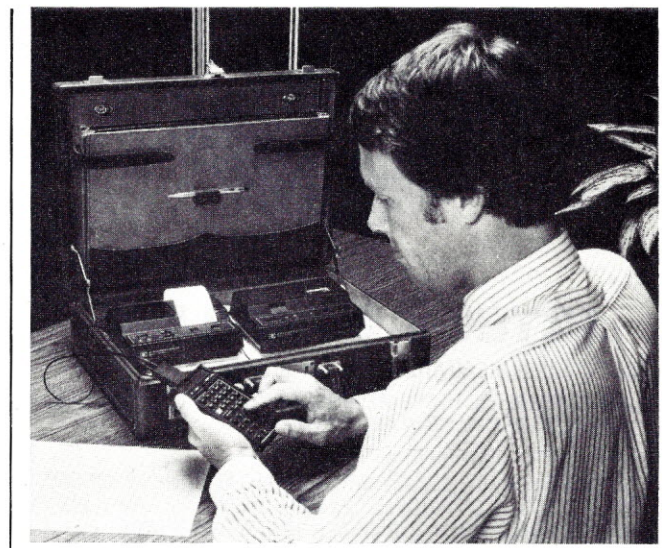


The Sharp PC-1500 handheld computer.

Single Board Computer

Teletek's SBC-I S-100 board contains a CPU, two serial ports, two parallel ports and 128K bytes of user RAM. The SBC-I can be used as a standalone single board computer or as a slave in a multitasking system. It has memory-management hardware that allows the on-board Z-80A (optionally Z-80B) to directly address 128K bytes in 4K segments. The board provides for up to 8K of on-board EPROM for initialization routines. The 2716/32/64 device can be disabled by software after the initialization process. Bus interface is via a 1K or 2K FIFO, allowing efficient communication to the system master. SBC-I appears as a set of I/O ports to the bus master. The two serial ports allow 19,200 bit-per-second communication, or, optionally, a high-speed RS-422 interface. Interface for a synchronous modem is provided. Price is $995.

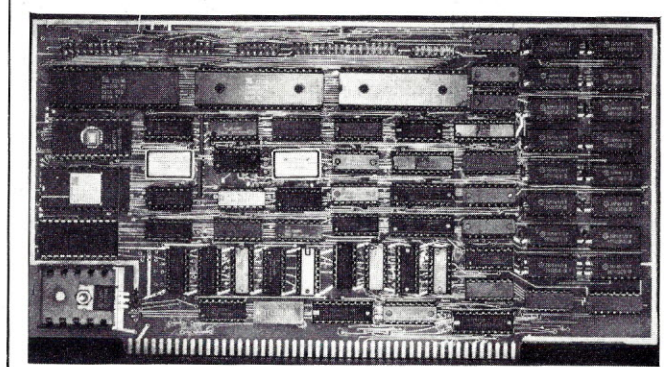
Teletek, 9767F Business Park Drive, Sacramento, CA 95827. Reader Service number 466.



This portable computing system is made possible by Hewlett-Packard's Interface Loop.

HP Interface

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Teletek's SBC-I single board computer.

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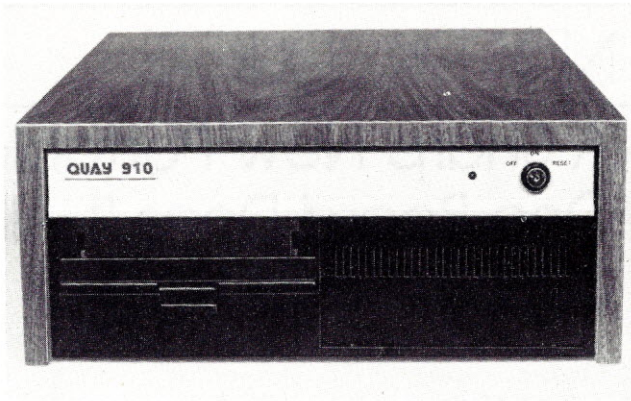
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The 910 series hard-disk microcomputer from the Quay Corporation.

operated portable controllers and devices makes possible a variety of low-cost microcomputer systems. The HP-IL interface uses a two-wire cable in a closed loop connecting all devices in series. Commands and data move around the loop in one direction at rates up to 5K bytes per second. HP-IL is a master-slave interface: One active controller controls traffic between all devices. Commands from the controller are received and retransmitted by every device but are acted on only by devices specified by the controller. Since data goes around the loop and returns to the originating device, HP-IL makes dependable error-checking easy. The loop structure and simple connectors speed the configuration of compatible devices that are available from Hewlett-Packard. A battery-operated computer like the HP-41 has enough power to control peripherals and instruments using HP-IL.

Hewlett-Packard Company, 1820 Embarcadero Road, Palo Alto, CA 94303. Reader Service number 465.

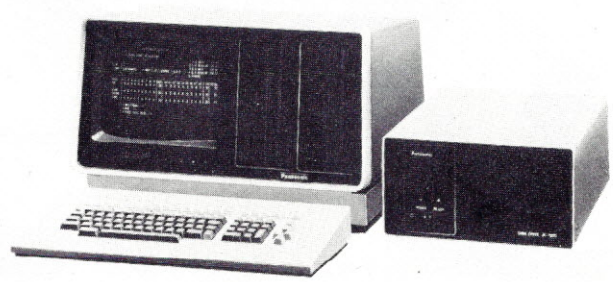
Fixed-Disk System

The JD-850M microcomputer features increased data storage capacity of more than 8.4M bytes with the optional eight-inch fixed-disk unit, model JK-7600. This computer runs CP/M and covers a wide range of business applications. It features a separate keyboard with improved key arrangement, a 12-inch nonglare video display and two eight-inch double-sided floppy drives. A buzzer and interval timer device are included. Base price is $8000; the JK-7600 fixed-disk drive costs an additional $3500.

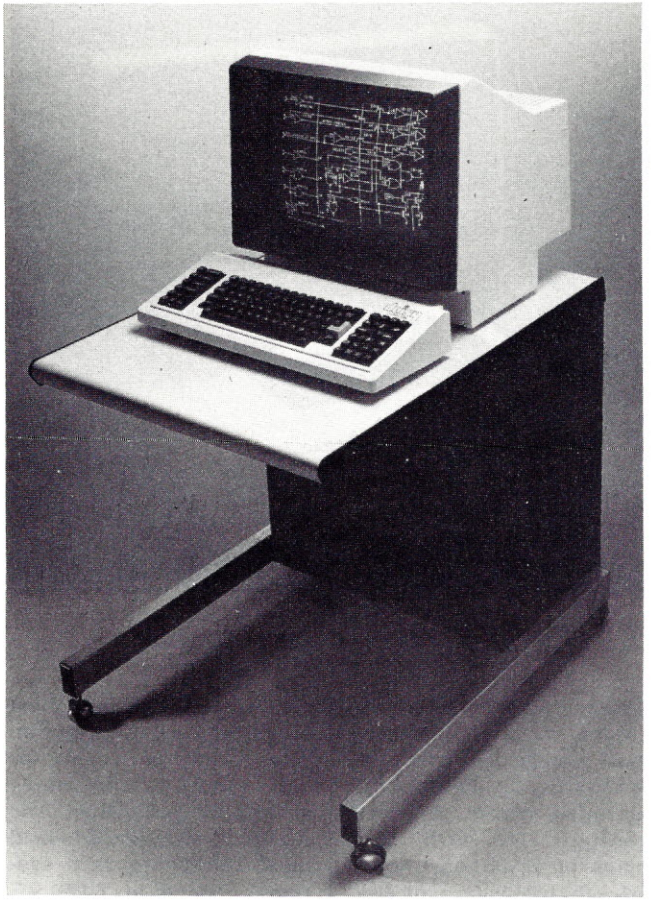
Panasonic, One Panasonic Way, Secaucus, NJ 07094. Reader Service number 473.

Eight-Inch Hard Disk System

The Quay 910 series hard disk microcomputer includes a 10M-byte Winchester hard disk, a double-sided, double-density floppy backup of 1.25M and on/off key lock reset control, in a single



Panasonic's Model JD-850M microcomputer system.



The Logician Engineering Work Station from Daisy Systems Corp.

cabinet. This Z-80A-based microcomputer offers IBM 3740 compatibility and expansion to 33M and 66M Winchester disk drives. The multi-user version features 208K of dynamic RAM to support up to four users, seven RS-232C serial ports and two eight-bit parallel ports. The MP/M disk operating system is standard. Seven higher-level languages and application packages are available.

Quay Corp., PO Box 783, 527 Industrial Way West, Eatontown, NJ 07724. Reader Service number 467.

Work Station Cuts Design Time

A new engineering work station from Daisy Systems Corp., 2118 Walsh Ave., Santa Clara, CA 95051, reduces the time required to design complex electronic equipment. The Daisy Logician allows engineers to communicate with a computer in the language they are accustomed to working with—graphics. Based on familiar concepts and procedures, the Logician combines traditional design methods with the benefits of the computer to improve productivity. In addition to being a powerful tool for design, storage and documentation of circuits, the Logician work station acts as a preprocessor that provides a single window into the many elements of electronic design: RTL simulation, logic simulation, circuit simulation, connectivity verification and test generation. The Logician is based on an 8086 microprocessor with 512K bytes of random-access memory. Reader Service number 481.

The Tin Can

Remark Datacom, Inc., 4 Sycamore Drive, Woodbury, NY 11797, introduces a low-cost, short haul modem, the Model 71. Like the proverbial two cans and a string, two Model 71s and two twisted pairs fulfill the requirements of a local point-to-point communications network for any RS-232C devices. The Model

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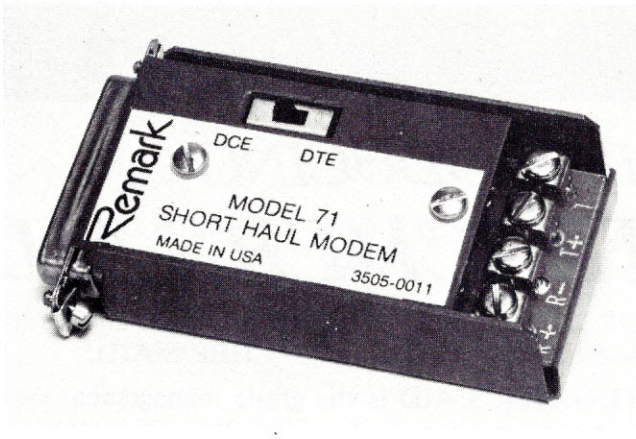
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Remark Datacom's short haul modem.

71 allows full duplex operation using two twisted pairs, or simplex operation using one twisted pair. Two Model 71 "tin cans" can communicate over a distance of two miles at 9600 bits per second or ten miles at 1200 bps. The modems are designed for asynchronous operation, so the network must provide dc continuity and be of the non-loaded type. The Model 71 is equipped with a switch for interfacing with DCE or DTE devices. Power is derived from the host. Price is $87. Reader Service number 468.

Software Storage

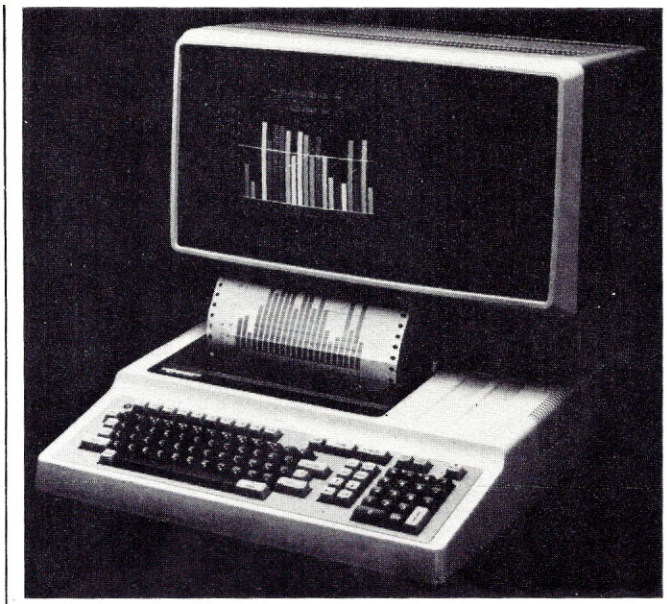
The HHP-16K EPROM memory offers Hewlett-Packard 41C/CV calculator users a cost-effective alternative for low- to medium-volume application program storage. Programs stored on magnetic media are converted to EPROM storage through a support service program offered by F.M. Weaver Assoc., Inc., 6201 Fair Valley Drive, Charlotte, NC 28211, and its dealers. The HHP-16K price is $241. The conversion service fee is $50 for a 4K-byte program, $75 for an 8K program or $100 for a 16K program. Reader Service number 469.

Z-80 Micro with Hi-Res Graphics

A new family of business micros from Japan is available through BMC Computer Corp., 860 East Walnut St., Carson, CA 90746. High-resolution graphics enhance reports, bar graphs, curves, electronic spread sheets and other business uses. The BMC if800 microcomputer includes keyboard, printer, mass storage disk drives, color video display and the CP/M operating system. A typical configuration with 128K bytes of RAM, one floppy drive, a 10M-byte hard disk, printer, display, RS-232 port, CP/M, WordStar, Super Calc and Multiplan costs under $12,000. Reader Service number 471.



The HHP-16K ROM emulator from F.M. Weaver Associates.



The if800 computer system from BMC.

Tidy Up!

Get your micro off the dining room table! The Applekart, by System Solutions, Inc., 16783 Beach Blvd., Huntington Beach, CA 92647, is a neat solution to computer clutter at home or in the office. The cart includes a pull-out work space, two pop-up side work areas, complete electrical wiring, on/off switch with external light indicator, sturdy wheels for easy mobility, and ample storage for peripherals. The Applekart is designed to hold most microcomputer systems. Priced at $429.95, $439.95 with lock. Reader Service number 480.

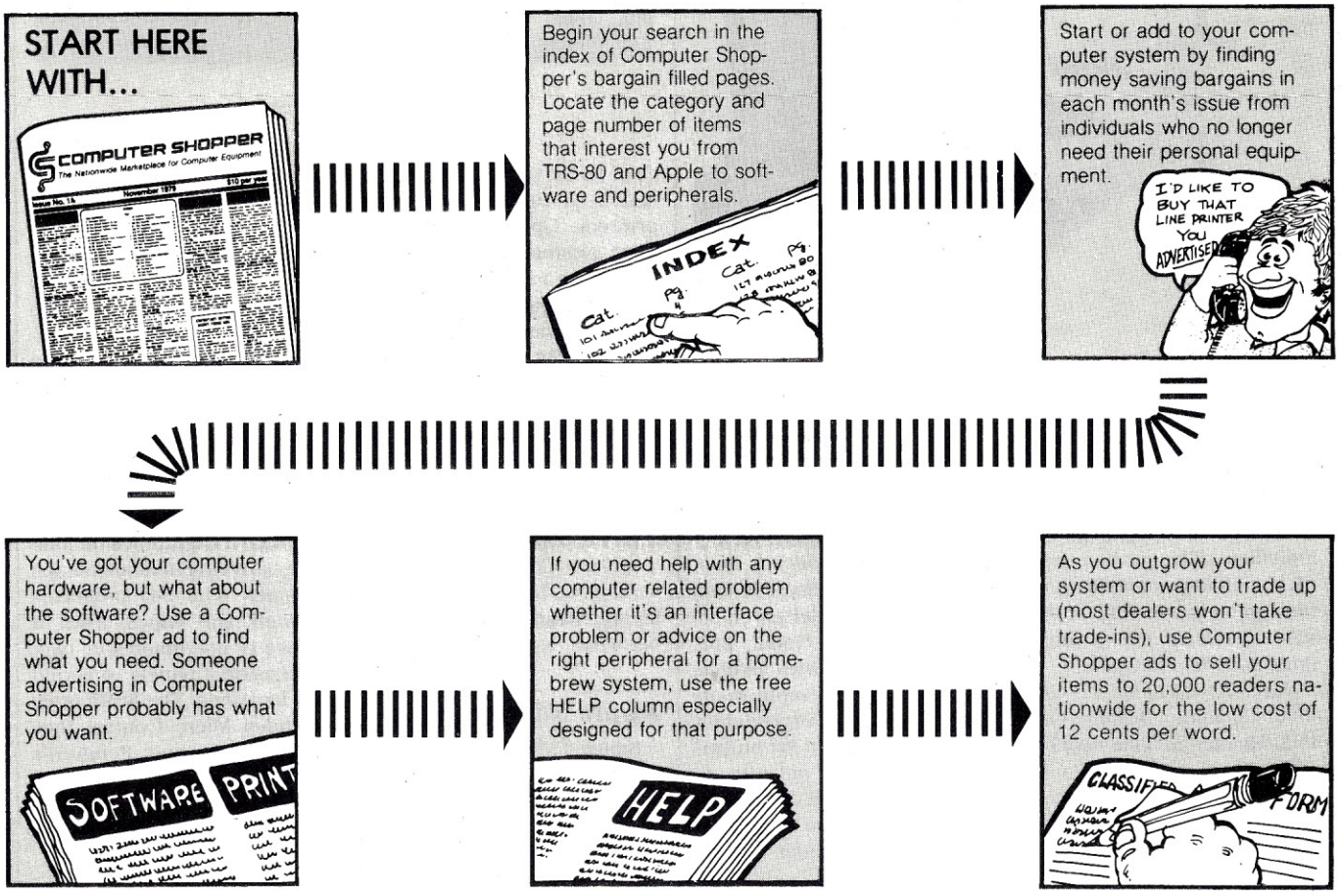
Quick Status Check For RS-232C Interface

The Navtel Supercheck breakout box provides a method for testing communications on the RS-232C interface. It is inserted between the computer and the modem, terminal or printer, and provides 12 LED monitors that indicate at a glance the status of key data, clock and control



The Applekart from System Solutions, Inc.

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Supercheck, a handy test device from Navtel.

leads. Twenty-five DIP switches provide interrupt and cross-patch ability for any combination of leads on the interface. The unit comes with a storage compartment containing an RS-232C cable and miniature patch cords. Price is $139, Canadian.

Navtel, 8481 Keele St., Unit 11A, Concord, Ontario L4K 1B1. Reader Service number 472.

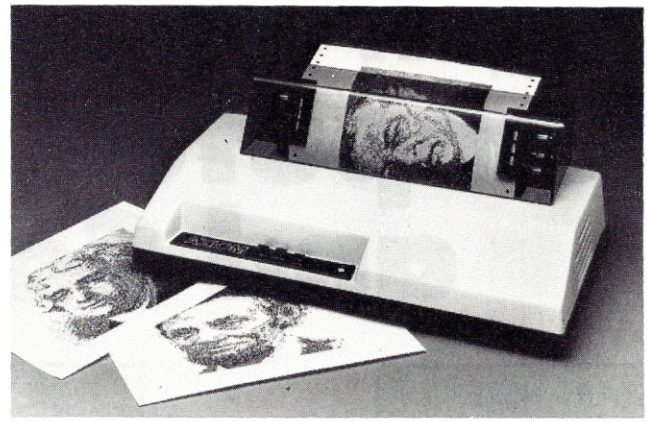
Serial/Parallel I/O Interface

SSM Microcomputer Products, Inc., 2190 Paragon Drive, San Jose, CA 95131, offers the IO5, a combination serial/parallel input/output board. The IO5 features two asynchronous RS-232 serial interfaces to simplify peripheral additions to the bus, and header selectable variable data rates to support a variety of high-speed serial data transmission devices. It also offers three parallel ports, including a bidirectional, programmable port with 16 data lines, an eight-bit input interface for general-purpose data entry and an eight-bit output interface. Data activity is monitored via send/receive LED indicators on each line. Price is $329. Reader Service number 470.

Quad-Density Graphics Printer

The Imp-4 is the first printer to offer quad-density graphics. The new printer gives the user high speed and more than twice the graphics resolution of other dot matrix printers. Up to 19,008 dots print bidirectionally in a single square inch; this tight dot placement yields better graphics resolution. Alphanumerics are also printed bidirectionally, in six different sizes and boldface, with lowercase descenders, at speeds up to 100 cps. Software control codes let the user determine printer functions. Price for the Imp-4 is $699.

Axiom Corp., 1014 Griswold Ave., San Fernando, CA 91340. Reader Service number 476.

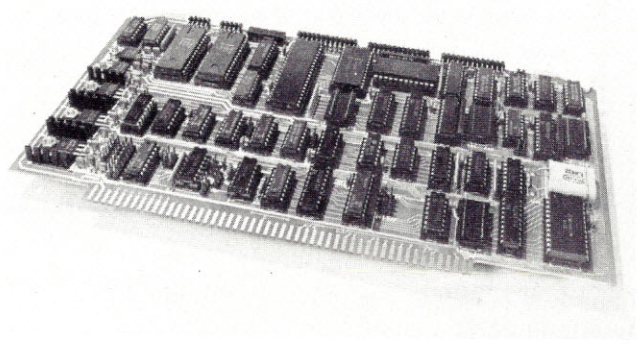


The Imp-4 from Axiom Corp.

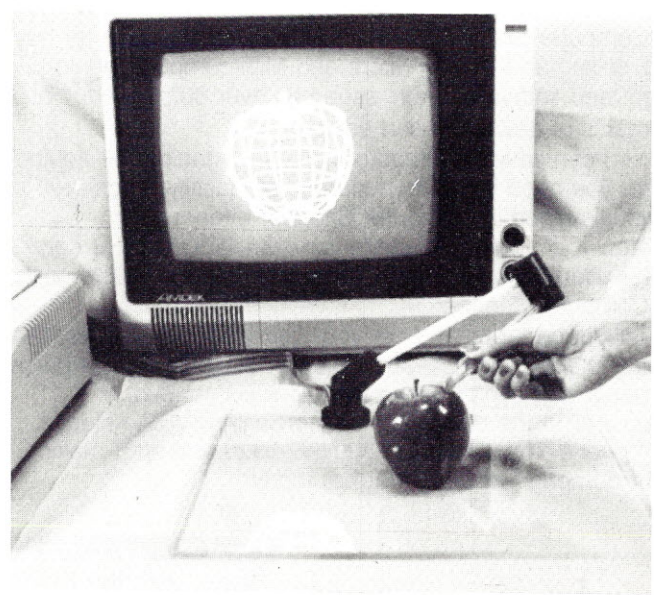
Apple 3-D Graphics

Space Tablet is a combination hardware/software product for the Apple II. A clear 16 × 13 inch tablet provides a two-dimensional workspace. An arm at the top center of the tablet has an elbow that lets it swivel on the tablet's surface; it can also rotate above the tablet. The position of the tip of the arm is converted by the computer to x, y, z coordinates, making it possible to actually trace three-dimensional objects. The tablet has two buttons connected to the Apple via the paddle port, for additional input. The provided software permits 2-D or 3-D use. The 2-D graphics include hi-res drawing, text and shape routines. The 3-D programs expand the input from a choice of coordinates or two-dimensional panels to actual 3-D locations. The $395 price includes Micro Control System's tablet and Penguin's software.

Penguin Software, PO Box 432, West Chicago, IL 60185. Reader Service number 474.



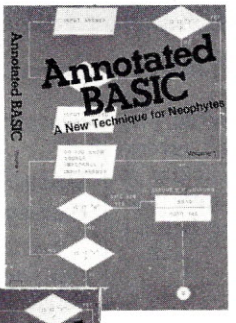
The SSM IO5 interface board.

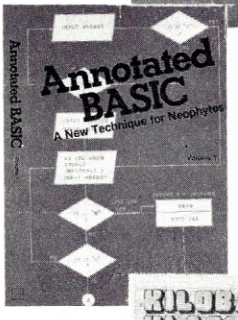


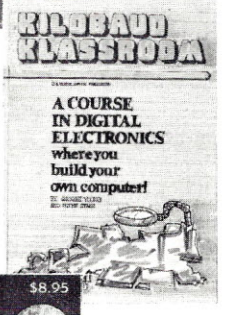
The MCS Space Tablet includes software from Penguin.

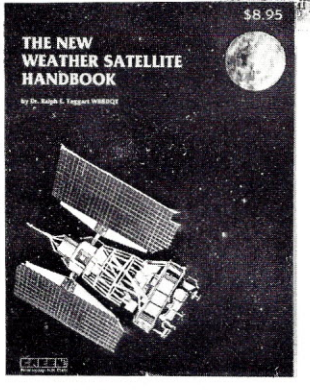
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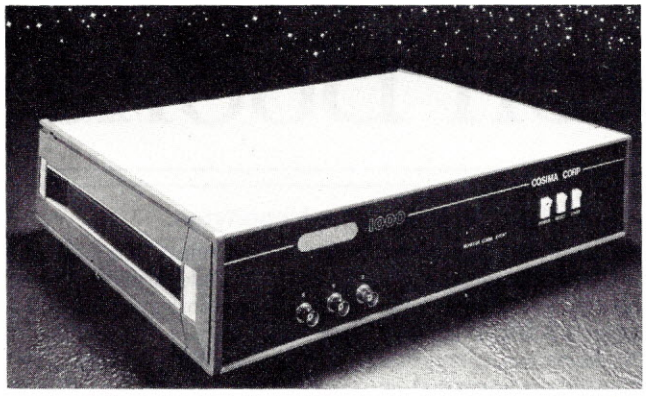
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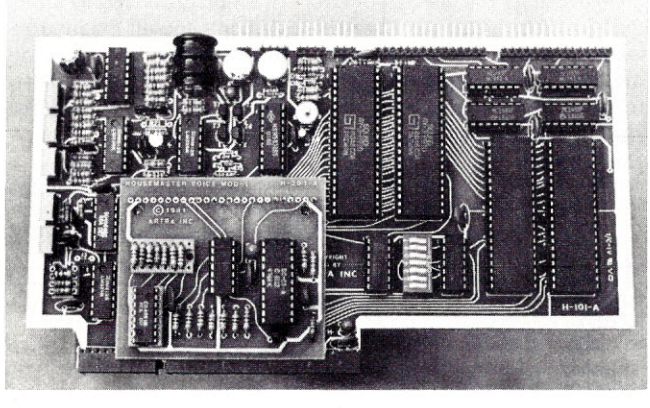
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Cosima Corp., PO Box 12789, Salem, OR 97309. Reader Service number 478.

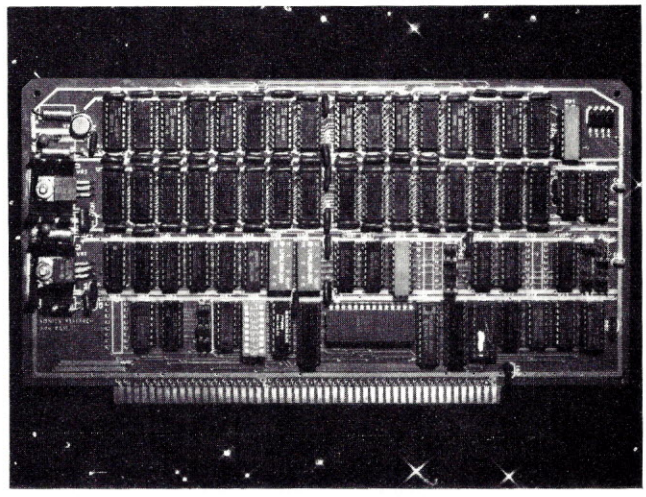
H/Z-89 Peripheral

Artra, Inc., PO Box 653, Arlington, VA 22216, is announcing Housemaster—an add-on printed circuit card for the Heath/Zenith-89. The standard Housemaster board provides the computer with four separate peripherals on a single printed circuit card. These include voice recognition, stereo sound synthesis, a real-time clock/calendar and a BSR-X-10 home control interface. Available options are a battery backup for the clock, two types of voice synthesis and two RS-232 serial ports.

All options mount on the same board. A full disk of 17 programs is provided along with a 90-page manual. The programs are written in either Basic or assembly language, and demonstrate all features on the board. By combining all four, the program provides control of household devices by voice, date/time or keyboard. User-developed subroutines can be added and controlled in the same way. Housemaster costs $399 for the kit and $479 for the assembled, calibrated and tested version. The recommended battery backup is $29 for the kit and $39 assembled. Reader Service number 477.



The Housemaster board from Artra, Inc.



The Sonic Micro Systems memory board.

64K RAM Board

Sonics Micro Systems' 64K bank-selectable random access memory is an inexpensive board that uses only 6½ W of power. It features continuous memory refresh during system resets and long wait states, and true bank selectability in 16K levels. Each 16K bank can be assigned to any of four locations within the 64K address space, and can be enabled and disabled via software control. The board is compatible with Cromemco, North Star, Vector Graphics and other Z-80 systems. Priced at $545.

Sonics Micro Systems, 1500 N.W. 62 St., Suite 409, Ft. Lauderdale, FL 33309. Reader Service number 475.

Universal Hard-Disk Subsystem

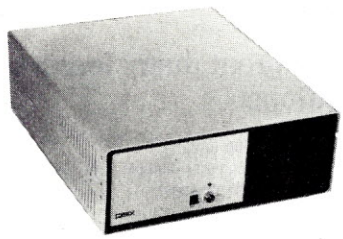
The MSC 9700 Winchester disk storage subsystem can be adapted for most popular microcomputers by adding a host adapter personality card. When used with a specific host adapter, the MSC 9700 emulates the software protocol of the host computer. The MSC 9700 can back up stored programs and data with either a second Winchester disk drive or a floppy drive. The standard subsystem combines one Seagate Technology ST-506 5¼-inch Winchester disk drive, Xebec S1410 controller and a reliable 115/230 V power supply. Price is under $3000. Average cost of available host adapters is under $200.

Microcomputer Systems Corporation, 432 Lakeside Drive, Sunnyvale, CA 94086. Reader Service number 479.



Microcomputer Systems Corp.'s MSC 9700 storage subsystem.

GIMIX 2MHZ 6809 SYSTEMS



GIMIX offers you a variety of system packages including systems that feature BOTH **MICROWARE's OS-9** Level 1™ operating system and **TECHNICAL SYSTEMS CONSULTANTS' FLEX**™. Switch between these two predominant 6809 Disk Operating Systems, under software control, without the need to change PROMS, switches, or system configuration. System packages are also available for **MICROWARE's OS-9** Level 2 and **TECHNICAL SYSTEMS CONSULTANTS'** UniFLEX™. You can select one of our featured systems or select from our wide variety of system components to build a custom system to suit your needs.

All systems include any required CPU Board options and are completely configured to your specifications. They do not include disk drives or terminals. See pages 4 and 5 for information on 5¼'' drives for installation in the CLASSY CHASSIS and/or 8'' disk drives and cabinets. Any combination of 5¼'' and 8'' floppy disk drives, up to four drives total, can be used with systems that include controller (except UniFLEX™systems which require 8'' drives).

For information and pricing on additional options see the appropriate pages of this brochure or contact the factory.

56KB 2MHZ 6809 SYSTEMS WITH GMXBUG/FLEX/OS-9 SOFTWARE SELECTABLE

INCLUDES: CLASSY CHASSIS, 6809 PLUS CPU Board, 56K Byte STATIC RAM, #43 Two Port Serial I/O board w/cables, and...

with #58 single density disk controller (System #59) **$2988.59**

with #68 DMA double density disk controller (System #49) **$3248.49**

To substitute Non-Volatile CMOS RAM with battery back-up, add . . . . . **$ 150.00**

128KB 2Mhz 6809 DMA Systems for use with TSC's UNIFLEX or MICROWARE's OS-9 Level 2

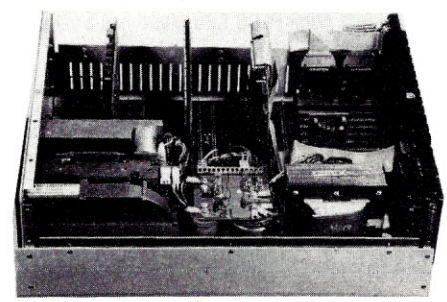
INCLUDES: CLASSY CHASSIS, 6809 PLUS CPU Board, #68 DMA Disk Controller, Two 64K Byte STATIC RAM Boards, #43 two Port Serial I/O board w/cables, (software not included. UniFLEX™ requires 8'' disk drives) **$3798.39**

To substitute 128KB of Non-Volatile CMOS RAM w/Battery Back-Up add . . . . . **$ 300.00**

56 KB SYSTEM #29 This system can be used as the basis for a custom system to suit your special needs. It includes: CLASSY CHASSIS, 6809 PLUS CPU, 56KB STATIC RAM Board, and #43 TWO PORT SERIAL I/O board w/cables. You can add to this your choice of Disk Controllers, Memory, I/O, Software, etc. **$2498.29**

50 Hz version of above add . . . . . **$ 30.00**

The GIMIX CLASSY CHASSIS™
6800 / 6809 SS-50 BUS MAINFRAME



The CLASSY CHASSIS includes:

A HEAVYWEIGHT, ALUMINUM CABINET (18'' wide x 21'' deep x 7'' high) painted in a putty colored, durable baked enamel finish. The cabinet holds our 6800 / 6809 mother board. CV Ferro-resonant power supply, and has provisions for mounting one or two 5¼'' Floppy or Winchester disk drives. The back panel is punched for 15 ''D'' type data connectors (25 pin) and has provisions for two removable connector plates that are available in a variety of connector configurations. Cabinets are normally supplied with two blank plates unless other types are required or specified. The cabinet includes a fan and ventilation slots which direct cooling air over the boards and power supply. The front panel has a 3 position, key locking, power switch that permits the reset switch to be locked out, preventing accidental system reset, and a three position RESET / ABORT switch. Optional filler plates are available for systems that do not use the 5¼'' drive openings.

The 6800 / 6809 SS-50 / C MOTHERBOARD includes:

This highly versatile motherboard is easily reconfigured for a variety of 6800 and 6809, SS-50 and SS-50C bus configurations.

GOLD PLATED connectors are used throughout to insure long lasting electrical contact and protection against corrosion.

It has fifteen 50 pin slots, 8 DIP-switch addressable 30 pin I/O slots, and a special 10 pin slot for the baud rate generator board. The fully buffered I/O block can be configured for 4, 8, or 16 decoded addresses per slot, and is DIP-switch addressable to any 32, 64, or 128 byte boundary. Extended address decoding (SS-50C) allows the I/O block to be addressed anywhere in the 1M byte address space.

The baud rate generator board provides 11 standard (16X) baud rates, from 75 to 38.4K, in 2 groups. Programming jumpers allow easy selection of up to five baud rates. The five baud rate lines on the 50 pin bus are easily disconnected from the 30 pin bus for use with SS-50C extended addressing or as user defined lines. A slow I/O circuit, for the 6809 CPU, can be used to generate an MRDY signal whenever an I/O slot is accessed (This allows, for example, using PIO Disk Controllers with a 2MHz. 6809 CPU).

All data, address, and control lines are fully terminated and separated by noise reducing ground lines on the bottom of the board.

The .090'' thick, double sided P.C. board has a full ground plane Faraday Shield on the top side to further reduce noise.

The CV Ferro-resonant Power Supply features a custom designed for **GIMIX** to GIMIX specs Constant Voltage, Ferro-resonant, faraday shielded, transformer that provides brown-out and overvoltage protection and permits the system to operate properly, even under adverse AC power input conditions. It also includes an AC line filter and AC resonant capacitor, 3 DC filter capacitors, and **GIMIX** unique filter assembly board that has a clamping terminal block for easy wiring connectors. The power supply provides +8 Volts at 30 Amps, +16 Volts at 5 Amps, and −16 Volts at 5 Amps; enough to power a fully loaded system plus the two 5¼'' Disk drives, including Winchester types, that can be installed in the cabinet. All supply outputs are filtered and individually fused. The standard version operates over an AC input range of 90 to 140 Volts, 60 Hz. Export versions are available for inputs of 95 to 130 or 190 to 260 volts, 50 Hz.

CABINET, MOTHERBOARD, and POWER SUPPLY assembled, burned in, and tested $1198.19

50 Hz Export versions (specify voltage) Add . . . . . **$ 30.00**

Please see page 7 for information on optional front panel filler plates, disk regulator boards, back panel connector plates, and back panel cable sets.

NOTE: Due to weight restrictions, GIMIX MAINFRAMES with 5'' drives installed and GIMIX 8'' DISK CABINETS with drives installed cannot be shipped via UPS. At the customers option we will ship these systems via UPS with the drives packed separately or via air freight (EMERY) collect, with the drives installed. Please specify the desired shipping method when ordering. Regardless of the shipping method chosen, all systems are assembled and tested as complete units before shipping.

TO ORDER BY MAIL: SEND CHECK OR MONEY ORDER OR USE YOUR VISA OR MASTER CHARGE. Please allow 3 weeks for personal checks to clear. U.S. orders add $5 handling if order is under $200.00. Foreign orders add $10 handling if order is under $200.00. Foreign orders over $200.00 will be shipped via Emery Air Freight COLLECT, and we will charge no handling. All orders must be prepaid in U.S. funds. Please note that foreign checks have been taking about 8 weeks for collection so we would advise wiring money, or checks drawn on a bank account in the U.S. Our bank is the Continental Illinois National Bank of Chicago, 231 S. LaSalle Street, Chicago, IL 60693, account #73-32033. Visa or Master Charge also accepted.

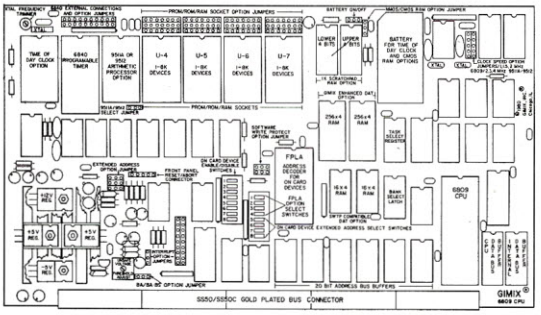
Be sure to add **$30.00** for each 50Hz power supply where needed.

GIMIX Inc. reserves the right to change pricing and product specifications at any time without further notice — **GIMIX**® and **GHOST**® are registered trademarks of GIMIX Inc. ©1982 GIMIX Inc.

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GIMIX 6809 CPU BOARD for the SS-50 BUS

The **GIMIX 6809 PLUS CPU** is an extremely versatile board that offers the user a great many features and options which make it an ideal choice for a variety of systems and applications.



- Any one of 3 memory management techniques can be used:
  - Straight Bank Select
  - GIMIX Enhanced DAT w/software write protect (optional)
  - SWTPC compatible DAT (required for SBUG-E) (optional)
- Software write protect in 4K blocks, of the entire address space (when GIMIX enhanced DAT is installed)
- Jumper selectable processor clock speeds (1, 1.5, 2 MHz.)
- Separate buffers for the 6809 and the on card devices
- 4 PROM/ROM/RAM sockets for monitors and user software (up to 32K)
- PROM/ROM/RAM sockets individually jumper selectable for single or multiple supply voltage and 1, 2, 4 or 8K byte devices (Some FPLAs do not support 8K devices)
- 1K bytes of scratchpad RAM
- 6840 programmable timer with provisions for external clock, gate and output connections
- Time of Day Clock (58167) w/Battery backup
- 9511A or 9512 Arithmetic Processor w/Jumper selectable 2, 3, or 4 MHz. clock speeds (optional)
- FPLA address decoding for the 8 on card devices 4 PROM/ROM/RAM sockets, 58167, 9511A/9512, 6840, 1K scratchpad RAM
- Software switching of address configurations for the 8 on card devices (allows software switching between on board PROM/ROM/RAM resident system monitors)
- All FPLA decoded devices can be individually enabled/disabled
- FPLA decoded devices are available for DMA access
- Extended addressing for the FPLA decoded devices (can be disabled)
- Software switching between on and off board system monitors using extended addressing.
- Jumper selectable interrupts for the 6840, 58167, and 9511A/9512
- NMI input can be jumpered to the bus or to an external connector
- BA & BS jumper selectable for independent or gated operation
- User defined latch output
- Gold MOLEX connectors for trouble free contact
- SS-50 and SS-50C compatible
- Full DMA compabilities (works with any of the 6809 DMA methods)
- Full Slow memory capabilities
- Fully assembled, tested and burned in

NOTE: GIMIX 6809 CPU BOARDS do not include a baud rate generator. In systems that require a baud rate generator, it must be provided elsewhere. The **GIMIX** 6800/6809 mainframe includes a baud rate generator on the mother board.

2 MHz 6809 PLUS CPU #05 . . . . . $578.05

The **GIMIX 6809 PLUS CPU** board has a variety of other options that may be ordered at the time of purchase or added later. it is fully socketed to allow adding the following options at any time.

GIMIX ENHANCED Dynamic Address Translation **$35.00**

SWTPc Compatible DAT (required for SBUG-E) **$15.00**

1K CMOS Scratchpad RAM (1.5 MHz) Substitution . . . . . **$ 8.00**

ARITHMETIC PROCESSORS

9511A (32 bit math w/transcendentals) 4 MHz **$312.00**

9512 (64 bit math only) 3 MHz **$265.00**

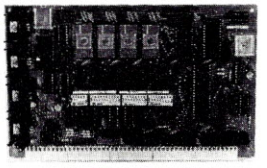
GIMIX 6800 CPU BOARD

- 6800 MPU
- 4K EPROM (2708)
- 128 byte RAM
- 6840 Programmable timer (optional)
- DIP-switch EPROM addressing, compatible with most standard 6800 monitors.

. . . . . **$224.03**

With 6840 . . . . . **$288.06**

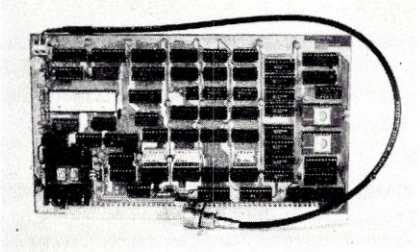
Baud Rate Option Add . . **$ 30.00**



THE UNIQUE GIMIX 80 x 24 VIDEO BOARD

Upper and Lower Case with Descenders • Hardware Scrolling

Contiguous 8 x 10 Character Cells • X-Y Addressable Hardware Cursor



IT IS THE ONLY VIDEO BOARD THAT GIVES YOU: A user programmable RAM character generator. Custom character sets, up to 128 characters each, can be stored and loaded into the board **under software control,** from disk, tape, etc.

The ability to choose, **under software control,** 256 displayable characters from 384 available in the 3 on board (2 EPROM and 1 RAM) character generators.

The ability to divide the 256 displayable characters into 8 groups, according to **both** ASCII Code and bit 8; lets your program determine how each group is displayed. (Which character generator to use, and whether it will be normal or inverse video, full or reduced intensity or a combination of these.)

GHOSTability: to place multiple boards at the same address and access them individually without affecting the display of the other boards.

The ability to control all these features, on the fly, through software.

★ Fully decoded, occupies only 2K of address space. ★ Fully socketed — Gold bus connectors. ★ Assembled, Burned In, and Tested at 2MHz.

Deluxe Version with RAM Character Generator . . . **$458.76** Without RAM Character Generator . . . **$398.74**

★ *50 Hz Versions Available* ★

Versions of GMXBUG-90/FLEX and OS-9 that use the GIMIX 80 x 24 VIDEO BOARD in place of a serial terminal are available. These versions require a user supplied video monitor and parallel ASCII keyboard. Contact GIMIX for more information.

Also Available: For Use with Master Antenna Systems,
Our 64 or 32 x 16 Fully Interlaced, Uppercase Only, Video Board **$198.71**

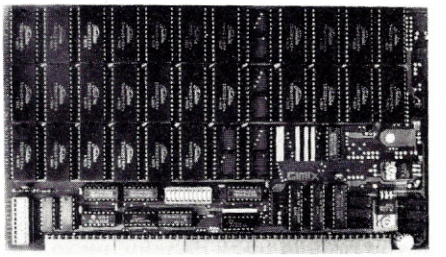
GIMIX INC.
1337 WEST 37th PLACE
CHICAGO, ILLINOIS 60609
(312) 927-5510 • TWX 910-221-4055

2MHz 64K BYTE STATIC RAM BOARD $638.67

for 6800 and 6809 systems using the SS-50/SS-50C bus

Also available...

56K $578.57
48K $518.47
32K $398.37
24K $348.27



All versions have gold bus connectors and are fully socketed, assembled, burned in, and tested. Versions with less than 64K can be expanded at any time by adding additional RAM chips.

FEATURES:

★ ADDRESSABLE in two 32K sections with separate regular and extended address decoding for each section. Each section can be addressed to any 32K boundary in the address range (1M Byte with extended addressing). Each 32K section is divided into four 8K blocks that can be individually enabled or disabled. Disabled sections do not occupy address space.

★ FULLY STATIC MEMORY does not require complicated refresh timing or clocks for data retention. Compatible with any ot the 6800/6809 DMA techniques.

★ GUARANTEED 2Mhz. OPERATION uses high speed (200 ns.) memory with no wait states or clock stretching required.

★ LOW POWER NMOS RAM requires less than 3/4 AMP (750 ma) typical at 8V, for a fully populated 64K board.

Also available...

NON-VOLATILE 64K BYTE CMOS STATIC RAM BOARDS with BATTERY BACK-UP

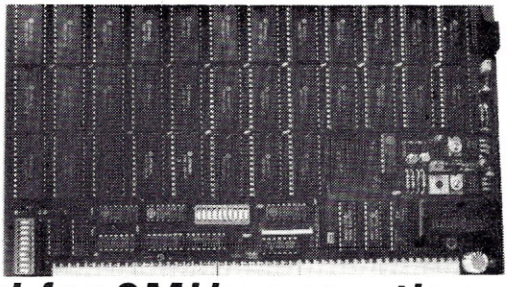
With all the versatility of the above boards... PLUS!

★ NON-VOLATILE MEMORY with built in battery back-up. Retains data even with system power removed. With the battery fully charged, data remains intact for a minimum of 21 days.

★ ULTRA-LOW POWER CMOS RAM requires less than 1/4 AMP (250 ma.) typical at 8V for a fully populated 64K board.

★ LOW BUS VOLTAGE DETECTION inhibits memory access during power up and power down to prevent false writes to the memory.

★ WRITE PROTECT SWITCH permits the entire board to be write protected for PROM/ROM emulation and software debugging.



64K..$798.64 — 56K.. $728.56 — 32K..$518.36

All above RAM Boards are guaranteed for 2MHz operation.

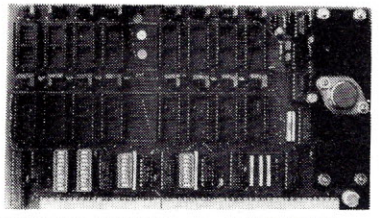
16 SOCKET EPROM/ROM/RAM BOARD

WITH EXTENDED ADDRESS DECODING

For Use With: Existing SS50 Systems and SS50C Extended Address Systems

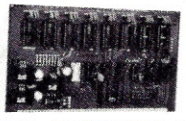
FEATURES: Up to 128K on a single board (using 8K devices)

Can be used with 2, 4, and 8K 24 pin, 2716/2516 pinout, single supply voltage EPROMs and most pin-compatible ROMs and static RAMS.



- Device sizes and types can be mixed on the same board
- 2 separate 8 socket sections
  - DIP-switch selection of base address for each section
  - Individual address decoders for each section, including extended address decoding
  - Bi-polar PROMs for address decoding allow mixing of device sizes within a section
  - Separate slow memory generation for each section. (6809 only)
- Each socket is jumper programmable for device size and type (2, 4 or 8K PROM/ROM/RAM)
- Fully Buffered • Fully Socketed • Gold Bus Connectors

ASSEMBLED, BURNED-IN, AND TESTED $238.32



8K PROM BOARD $98.34

- Holds eight 2708 or 2708-compatible ROMS. • Gold Bus Connectors
- DIP-switch addressable to any 8K boundary.

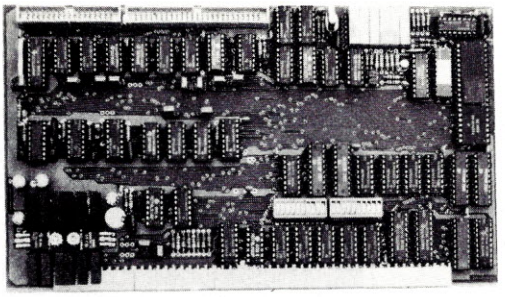
HIGH RESOLUTION BIT MAP GRAPHICS BOARD SET

FEATURES: — 512 x 512 Dot resolution — A board set consisting of the Graphics Controller Board and the Screen Memory Board (32K of memory) — Does not tie-up the processor or system bus for screen refresh — Occupies 8K of address space plus 8 bytes for control ports — Separate DIP-switch selection for screen memory and control port addressing — GHOSTability allows multiple boards to be placed at the same address and be enabled/disabled under software control — Extended address decoding for SS50C extended address lines

ASSEMBLED BURNED IN AND TESTED $996.77

NOTE: This Graphic Board Set requires a high resolution video monitor such as the MOROTOLA M4408 with a 30KHz horizontal scan rate.

GIMIX INC. **1337 WEST 37th PLACE • CHICAGO, ILLINOIS 60609 • (312) 927-5510 • TWX 910-221-4055**



GIMIX DMA DOUBLE DENSITY DISK CONTROLLER #68

The GIMIX DMA (Direct Memory Access) DISK CONTROLLER has the capabilities needed to realize the full potential of todays sophisticated multi-user/multi-tasking operating systems such as OS-9™ and UniFLEX™.

HIGH SPEED using bi-polar logic DMA circuitry for guaranteed operation at 2MHz. DMA transfers take place at full bus speed using 6809 cycle steal DMA. Once the required parameters are passed to the controller and DMA transfer is initiated the processor is free for other tasks. Interrupts can be generated to indicate the completion of the transfer.

SINGLE AND DOUBLE DENSITY data storage on any combination of 5¼" and 8" floppy disk drives; single and double headed, single and double track density, up to 4 drives total.

LOW ERROR RATES are insured by a data recovery circuit (data separator) and adjustable write precompensation circuitry for drives that require precomp. Separate precomp adjustments are provided for 5¼" and 8" drives.

ADDRESSABLE to any 8 byte boundary in the address space (1M byte when extended address decoding is used). The board occupies only 8 bytes of address space.

EXTENDED ADDRESSING control using the SS-50C extended address lines. Control of the extended address lines allows the board to perform DMA transfers to and from any address in the 1M byte address space.

FULLY BUFFERED with separate 5¼" and 8" output buffers and schmidt trigger input buffers for the disk drive signals.

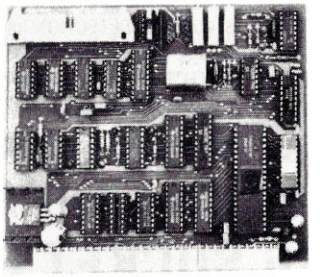
The DMA controller leaves the processor free to perform other tasks once the transfer is initiated, unlike programmed I/O disk controllers which require full time use of the processor during data transfers to and from disk.

This is extremely important in a multi-user/multi-tasking environment as the processor can perform other tasks such as console I/O while a disk transfer is in progress.

#68 fully assembled, burned in, and tested $588.68

GIMIX DOUBLE DENSITY PIO DISK CONTROLLER #28

The GIMIX DOUBLE DENSITY PIO (PROGRAMMED I/O) DISK CONTROLLER is a versatile floppy disk interface for use in 6809 systems on the SS-50 or SS-50C bus. The board physically occupies one slot of the 30 pin I/O bus.

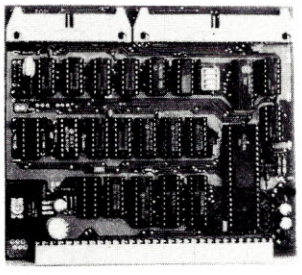


- Double the unformatted storage capacity of single density controllers
- Single and double density operation
- Phase lock data recovery circuit (data separator)
- Adjustable write precompensation (precomp)
- Controls up to four 5¼" drives
- Controls single and double headed drives
- Designed to meet the data hold-time requirements of the Western Digital 1797 floppy disk controller I.C.

The GIMIX DOUBLE DENSITY PIO DISK CONTROLLER is ideal for systems that require greater data storage than that provided by single density controllers, without increasing the number or type of drives. In most cases existing 6809 systems can be upgraded by adding only the controller and the appropriate operating system software.

#28 fully assembled, burned in and tested $298.28

GIMIX 5/8 DISK CONTROLLER BOARD #58



The GIMIX 5/8 DISK CONTROLLER is a versatile floppy disk interface for use with both 6800 and 6809 systems on the SS-50 or SS-50C bus. The board physically occupies one slot of the 30 pin I/O bus.

- Hardware and software compatible with existing disk controllers (SWTPc DC-1, DC-2 and DC-3)
- Controls up to four 5¼" drives in 6800 systems
- Controls any mix of 5¼" and 8" drives, up to four drives total, in 6809 systems
- Provides for double headed drives
- Synchronous data separator for data reliability
- Designed to meet the data hold-time requirements of the 1771 floppy disk controller I.C.

The GIMIX 5/8 DISK CONTROLLER is ideal for a variety of applications including the replacement of controllers in existing systems. As a replacement it can provide the added advantages of a data separator, double headed drive capability, and in 6809 systems the ability to use 8" drives. Double headed drives and 8" operation may require appropriate operating system software.

#58 fully assembled, burned in, and tested $226.58

ALSO AVAILABLE: As above, but for 5¼" drives only **$198.48**

As above, but without 1771, tested, not burned in **$158.38**

NOTE: When ordering disk controllers please specify the make and model of the drives being used.

5¼" DRIVES INSTALLED IN GIMIX SYSTEMS with all necessary cables

	SINGLE DENSITY		DOUBLE DENSITY		
	Formatted	Unformatted	Formatted	Unformatted	
40 track (48TPI) single sided	199,680	250,000	341,424	500,000	2 for **$700.00**
40 track (48TPI) double sided	399,360	500,000	718,848	1,000,000	2 for **900.00**
80 track (96TPI) single sided	404,480	500,000	728,064	1,000,000	2 for **900.00**
80 track (96TPI) double sided	808,960	1,000,000	1,456,128	2,000,000	2 for **1300.00**

CHART SHOWS TOTAL CAPACITY IN BYTES FOR 2 DRIVES.

SOFTWARE AVAILABLE FOR GIMIX DISK SYSTEMS

GIMIX VERSIONS OF TSC's 6809 FLEX operating systems are available for all three **GIMIX** disk controllers. They fully support all the features of each controller and are software compatible with other versions of FLEX. **GIMIX FLEX** includes a disk FORMAT program that allows the user to pick the number of tracks to format, single or double sided disks, and where appropriate single or double density. It also supports both single (48 TPI) and double (96 TPI) track 5¼" drives and allows 80 track (96 TPI) drives to read, write, and format 40 track (48 TPI) disks. FLEX is single user and limited to 56KB systems.

Specify controller and type of drive: 8"; or 5¼" 40 or 80 track **$90.00**

NOTE: *FLEX requires a system monitor (e.g. GMXBUG or S-BUG E). When used with a SWTP CPU and S-BUG E and the GIMIX #68 DMA CONTROLLER, the GIMIX BOOTSTRAP PROM is also required.*

GMXBUG 09 includes advanced debugging capabilities as well as utility and memory manipulation routines. The standard terminal based version can be upgraded to video based for use with the GIMIX 80 x 24 Video board by changing the bootstrap PROM to the Video/bootstrap Prom. It can be used with either GIMIX DAT or SWTP DAT, but they are not required.

Price includes PROMs, Manual, and Source listing (Specify DAT) **$98.65**

Video/bootstrap or Bootstrap PROM only (included w/GMXBUG) **$30.00**

GIMIX' versions of **MICROWARE's OS-9 Level 1** are available for all GIMIX disk controllers. OS-9 includes PROMS and Disk. Microware's OS-9 Debugger is also included. Level 1 is multi-user, but limits user to 56KB Specify controller and type of drive: 8"; or 5¼" 40 or 80 track **$195.00**

★ ***SYSTEM SPECIAL*** ★ **GIMIX** offers you GMXBUG/FLEX/OS-9 selectable under software control. See System prices elsewhere in this brochure.

UNIFLEX is available for **GIMIX** Systems using the GIMIX 6809 CPU board and the #68 DMA Controller with 8" drives. It requires a minimum of 128KB of RAM. A signed license agreement with TSC is required before shipping. The SWTP DAT parts must be installed on the GIMIX CPU.

UNIFLEX . . . . . **$550.00** **GIMIX boot PROM for UNIFLEX** **$50.00**

MICROWARE's OS-9 Level 2 requires a minimum of 128KB of RAM. The GIMIX DAT parts must be installed on the GIMIX CPU.

GIMIX versions of Level 2 also include the Debugger *(To be available soon)* **$495.00**

A WIDE VARIETY OF LANGUAGES AND OTHER SOFTWARE IS AVAILABLE FOR THESE 6809 DISK OPERATING SYSTEMS

FOR MICROWARE's OS-9 LEVEL 1 & 2:

Macro Text Editor . . . **$125.00**	CIS COBOL . . . **$895.00**	OS-9 PASCAL . . . **$400.00**
OS-9 Assembler . . . **125.00**	Forms 2 Option . . . **200.00**	OS-9 C Compiler (Available Soon) . . . **400.00**
BASIC09 . . . **195.00**		

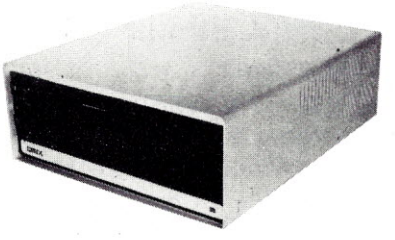
FOR TSC's FLEX

6809 Native-Code Pascal Compiler . . . **$200.00**	Sort/Merge . . . **$ 75.00**	Standard Basic Precompiler . . . **$ 50.00**
Basic . . . **75.00**	6809 Debug Package . . . **75.00**	Extended Basic Precompiler . . . **50.00**
Extended Basic . . . **100.00**	6809 Diagnostics Package . . . **75.00**	6809 FLEX Utilities . . . **75.00**
Text Processing System . . . **75.00**	6809 Assembler . . . **50.00**	68000 Cross Assembler . . . **250.00**
Text Editing System . . . **50.00**		

FOR UNIFLEX *1 Year Maintenace Included on all Uniflex Prices.*

UniFLEX Operating System (6809) . . . **$550.00**	UniFLEX Sort/Merge . . . **$150.00**	Fortran 77 (requires relocating assembler) . . . **$350.00**
UniFLEX Basic . . . **200.00**	UniFLEX Pascal . . . **300.00**	6809 Relocating Assembler & Linking Loader . . **175.00**
UniFLEX Basic Precompiler . . . **150.00**	UniFLEX 68000 Cross Assembler . . . **300.00**	Fortran & Relocating Assembler (pkg. deal) **450.00**
UniFLEX Text Processor . . . **150.00**	Enhanced Printer Spooler . . . **150.00**	
C Compiler (Requires relocating assembler, available soon) . . . **400.00**	C Compiler & Relocating Assembler . . . **500.00**	

The above software is from **MICROWARE and TSC.** Numerous offerings of languages (e.g. C, PASCAL, FORTH), utilities (e.g. spelling dictionaries, cross assemblers, disassemblers) and application packages (e.g. word processing, data base management, accounting), are available from many other software houses.



8" DISK CABINET and POWER SUPPLY. The cabinet features the same quality, styling, and finish as the GIMIX MAINFRAME and mounts two standard size 8" floppy and/or winchester disk drives. It will also hold 4 thinline 8" floppys or a combination of 2 thinline floppys and an 8" winchester.

To provide an easy means of controlling the power to an entire system from one switch, three accessory outlets, one for the computer and two for peripherals (terminals, printer, etc.), are provided. The back panel mounted power switch selects either OFF, ON, or the AUTO mode. In the AUTO mode, the power supply and two of the accessory outlets are controlled by the computer (or other device), connected to the third accessory outlet. When the computer is turned on or off, the cabinet senses the presence or absence of current flow to the computer and turns itself and the other accessory outlets on or off. Circuitry is also provided to turn AC drive motors ON and OFF under computer control. A built in fan with a washable air filter provides cooling for the power supply and drives. The back panel is punched for 4 connectors (two 50 and two 20 pin) for connections between the cabinet and the computer.

The power supply uses a constant voltage Ferro-resonant transformer for reliability and protection against brownouts and power line noise. It provides +5 Volts at 6 Amps, +24 Volts at 6 Amps, and −5 Volts at 750 Ma. continuously; with ample surge capacity for drives that require higher starting currents. The supply has two separate 24 V. outputs that can be sequenced to delay starting of the second drive until the first is up to speed.

All units are fully assembled, burned in, and tested.

8" DUAL DRIVE DISK SYSTEM: includes two double sided 8" disk drives, cabinet, power supply, and all necessary cables to connect to a GIMIX MAINFRAME or controller (see shipping notes on page 8) **$2698.88**

8" DISK CABINET ONLY: includes power supply and AC & DC power cables **Note:** Because different drive models require different AC & DC connectors, be sure to specify the quantity and model number of the drives being used when ordering. **$848.18**

For 50 Hz Export power supply, add . . . . . **$ 30.00**

DRIVE CABLE: for 8" floppy drives includes connectors for the disk drives and a back panel connector for the 8" disk cabinet.

with 2 drive connectors **$44.82**

with 4 drive connectors **$67.84**

MAINFRAME CABLE: for use with the above cable; to connect the disk cabinet to GIMIX MAINFRAMES and disk controllers . . . **$45.81**

8" FILLER PLATE: used when only one drive is installed **$14.83**

GIMIX® and **GHOST®** are registered trademarks of GIMIX Inc. © 1982 GIMIX Inc. FLEX and UNIFLEX are trademarks of Technical Systems Consultants OS9 is a trademark of Microware Systems Corp. Inc.

GIMIX 2MHz INPUT / OUTPUT BOARDS

SERIAL INTERFACE BOARDS All GIMIX serial interface cards use the versatile 68B50 programmable ACIA that provides software control over: number of data bits, parity, stop bits, and interrupts; plus a full set of error and status flags. They all feature RS-232 compatible input/output with RTS, CTS, and DCD handshake signals.

The GIMIX SINGLE PORT serial interface also has 20 Ma. current loop output for use with GIMIX RELAY DRIVER BOARDS, teletypes, etc.

All serial boards have gold plated, header type connectors for corrosion resistance and reliable operation.

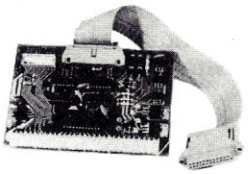
PARALLEL INTERFACE BOARDS All GIMIX parallel boards use the 6821 PIA for compatibility and versatility. Each 6821 provides two 8 bit ports with a variety of handshake and interrupt generation modes.

Optional cable sets are available to provide 25 pin "D" type data connectors for back-panel mounting.

SINGLE PORT SERIAL INTERFACE

(For the 30 pin I/O bus) $88.41

DIP-switches provide full control over I/O and handshaking configuration — easily accessible, no soldering necessary for:



* RS-232 or Current Loop select
* One of five baud rates or an external clock
* Optional connection to the Interrupt Request line
* Override of the DCD and CTS modem control signals

On-card regulators for +5, +12, and −12 volts provide power at the connector for modems, cassette interfaces, etc.

RS-232 and current loop drivers and receivers keep output from the GIMIX Serial Interface powerful and clean.

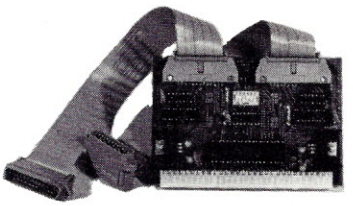
OTHER FEATURES INCLUDE:

* Modem Control Signals — has data carrier detect and clear to send inputs.
* Cassette Interface Control — has a diode-protected external clock input and a separate clock output.
* Secondary RS-232 input and output channels
* Current loop input and output
* Reader Control output
* Request to send output

TWO PORT PARALLEL INTERFACE CARD

(For the 30 pin bus): $88.42

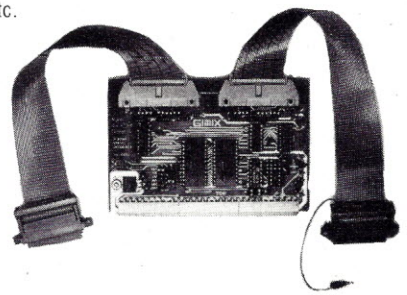
EACH PORT HAS:



- ✓ Eight data I/O lines — fully **buffered**, with Schmidt-trigger inputs for high noise immunity
- ✓ DIP-switch selection, of either **input** or **output**
- ✓ Its own **buffered** input handshaking line
- ✓ Its own **buffered** output handshaking line that is strappable for input.
- ✓ DIP-switches for connecting to the interrupt Request or the Non-Maskable Inerrupt lines.
- ✓ Its own professional-quality gold-plated header connector
- ✓ Gold Bus Connectors
- ✓ Its own DIP-socket for connecting to boards that need an external 8-bit or output port such as the GIMIX Opto board.
- ✓ On-card regulators for +5 and −12 volts provide power at the connectors for keyboards, tape readers, etc.

2 PORT SERIAL INTERFACE (For the 30 pin I/O bus) $128.43

Solderless jumpers provide easy selection and changing of options.



FEATURES:

- **2 separate RS-232 ports (with handshake) on a single board**
- **Jumper programmable connector pinouts for easier connection to external devices. (Connector can be programmed as DCE or DTE)**
- **Provides direct plug-in of standard RS-232 connectors when used with optional GIMIX cable sets.**
- **Individual baud rate and interrupt select jumpers for eacn port.**
- **Selectable for use with 4, 8, or 16 addresses per slot.**

8 PORT SERIAL BOARD

(For the 50 pin bus) $318.46

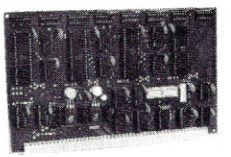
The GIMIX 8 PORT SERIAL INTERFACE has 3 header type connectors for external connections. The center connector provides Transmit Data, Receive Data, and signal ground for all 8 ports. The outer 2 connectors each provide TX, RX, and signal ground as well as the 3 handshake lines RTS, DCD, and CTS for 4 ports.

FEATURES:

* 8 separate RS-232 ports (with handshake) on a single 50 pin board
* Extended address decoding for the SS50C bus
* Occupies only 16 bytes of address space
* DIP-switch addressable to any 16 byte boundary
* Individual DIP-switch selectable baud rates and interrupts for each port
* On board buad rate generator for baud rates from 75 to 38.4K baud

8 PORT PARALLEL INTERFACE BOARD

(For the 50 pin bus) $198.45



* Eight 8 bit parallel ports on a single board
* Four 6821 PIAs
* 3 ports buffered for output
* 5 ports bi-directional (not buffered)
* Built in interrupt generator outputs 1 second or 1 minute interrupts
* Occupies 16 bytes of address space
* DIP-switch addressable to any 16 byte boundary

CABLE SETS FOR ALL ABOVE BOARDS . . . . ea. $22.95

Cable sets include: Ribbon cable with a matching connector for the I/O board, a 25 pin "D" type data connector for back panel mounting, and mounting hardware.

(Please specify which board when ordering cable sets)

GIMIX UNIVERSAL SYNCHRONOUS & ASYNCHRONOUS SERIAL I/O BOARDS.

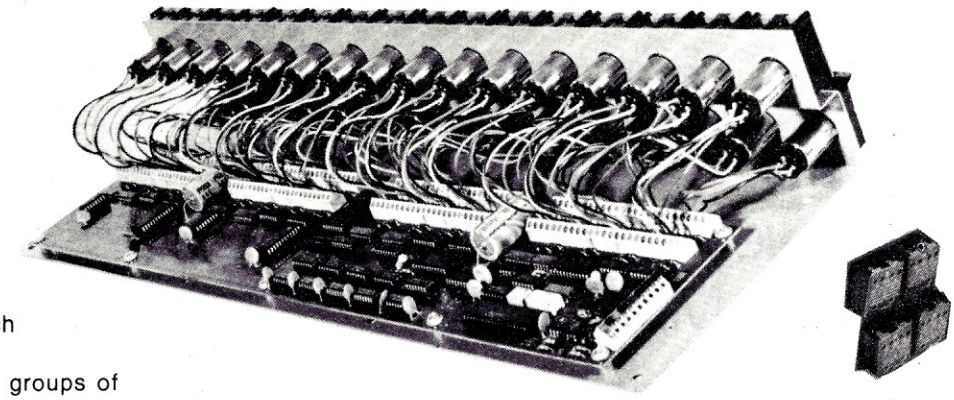
This 30 pin board is available in three versions: with a **68B50 ACIA**, a **68B52 SSDA** (Synchronous Serial Data Adapter) or a **68B54 ADLC** (Advanced Data-Link Controller). Control logic is provided for loop mode operation of the 68B54 ADLC. All three feature jumper selectable **RS-232C** or **RS-423** (single-ended), or **RS-422** (Differential) line drivers and receivers for the Receive data, transmit data, external clock, and handshake signals. External connections can be made through the 26 pin header at the top of the board or, when used with an optinal GIMIX cable set, a 25 pin "D" type data connector. The jumper programmable I/O connector pinouts can be arranged to suit a variety of interface configurations.

with 68B50 ACIA ($244.50) with 68B52 SSDA ($254.52) with 68B54 ADLC ($268.54)

GIMIX INC.
1337 WEST 37th PLACE
CHICAGO, ILLINOIS 60609
(312) 927-5510 • TWX 910-221-405

Control 31 Separate AC Circuits (20 amps max. ea.)

RELAY DRIVER BOARDS FOR A.C. POWER CONTROL



4 Boards (124 relays) can be connected to one 20 ma. current loop. Each board controls 31 G.E. RR8 relays.

Use multiple serial ports for additional groups of 124 relays.

SIMPLE TO CONNECT Only *two pairs* of wires coming from your computer are needed for each set of four Realy Driver Boards, these wires may be the standard telephone type.

REMOTELY LOCATABLE. Relay Driver Boards can be conveniently located for A.C. power distribution — away from the computer and other Relay Driver Boards. The board operates in either the active or the report mode, as specified by the computer. In the active mode, the board interprets the 8-bit data received as a command to turn on or off a particular relay. Following abrief interval to allow the selected realy to operate, the board senses that relay's status (on or off). If the status is other than expected, the computer takes appropriate action, as determined by the program. A command received in the report mode has the same results, except for relay activation. This allows the mode to check relay status at any time.

If the on-board UART detects a transmission error, such as in framing, parity, or overrun, no relays are activated and no status scan occurs.

Clamping terminal blocks for wiring simple SPST-N.O. momentary contact remote switches to individual relays or groups of relays, both on and off, provide manual control as in a normal low voltage switching system, even without the computer. In event of power failures, the relays will remain in the same state that they were in when power is restored. DATA rates up to 1200 baud, allow operating up to 120 relays per second on each port.

COMPACT — Only 24" x 5"

Distances and operation of boards and relays are dependent upon wire length and gauge, and type of transformer.

RELAY DRIVER BOARD ACCESSORIES

MOUNTING BRACKET ★ custom designed to hold a Relay Driver Board and 31 relays. The bracket (26" x 8¼" x 4") and transformer will fit in a standard electrical cabinet (extra room needed for wiring) creating a neat and easily installed system.

TRANSFORMER ★ 2 Amp., 24 volts. Custom manufactured to our specs for powering a Relay Driver Board and 31 G.E. RR8 relays.

G.E. RR8 RELAYS ★ 24 volt, split coil, mechanical latching type. Once ON they stay ON (drawing no current) until they are powered OFF, and vice-versa. Each relay can handle 20 AMPS for switching lights, motors, machinery, etc. up to 277 V.A.C. — UL listed.

PRICES

RELAY DRIVER BOARD ONLY	**$488.86**	TRANSFORMER	**$ 14.24**
BRACKET	**$ 38.21**	RELAY DRIVER PACKAGE	**$1083.08**

(Relay Driver Board, 31 RR-8 Relays, Bracket and Transformer)

OPTO-BOARD FOR REMOTE SENSING $348.85

Links any computer to 34 Outside-World Signals safely
Inputs isolated to 1500 volts
Perfect for detecting closure of switches and relays
Built-in Debouncing.
Signals may range from 5 to 24 volts D.C.
Can detect signals sent by devices such as wall switches, hidden floor switches, electric eyes, alarms, smoke detector, thermostats, and a multiplicity of other applications.

All switch ports are constantly scanned by an on-board circuit. No processor time is required. A built-in memory buffer saves up to 64 closed-switch signals, permitting the processor to complete lengthy tasks between interruptions.
FULL HANDSHAKING LOGIC:
DATA READY output DATA ACCEPTED input
BUFFER FULL output RESET input
ALL OUTPUTS ARE BUFFERED AND TTL COMPATIBLE

PARTS AND CABLE SETS FOR GIMIX BOARDS AND SYSTEMS

BAUD Rate Generator Board	$88.93	5" Disk Cable Set	$34.96
GIMIX double disk regulator with two 4 amp regulators to provide power for 5¼" drives	68.22	I/O Cable Set, each (specify board)	22.95
Filler plates (when no 5" drives are used), 2 required	14.92	GIMIX 2" D Ring Binder	9.00
Missing Cycle Detector	38.23	GIMIX 3" D Ring Binder	12.00
8" Disk Cable and Back Panel Connector Set	29.25	OPTIONAL Back Panel Connector Plates for Mainframe Choice of: Blank; SO-239; BNC; 20 & 50 Pin Header; 34 & 40 & 50 Pin Header. Connectors not included.	8.60
8" Disk Cable Set	44.26		

GIMIX 50 PIN PROTOTYPING BOARD

Double sided with plated thru holes and gridded power and ground lines. 16 rows of pads on.100 x .300 centers; up to 72 fourteen pin ICs. Accepts standard 6, 8, 14, 16, 20, 24, 28, and 40 pin DIP devices. The entire top edge has pads for .100 x .100 header (ribbon) connectors.

- Pads for solder connections or .100 center headers on all 50 bus lines.
- Accepts 4 TO-220 regulators; 2 on the +8V & 1 ea. on the +/− 16 V lines.
- Provisions for decoupling caps distributed throughout the array.
- Can be used with wire wrap, wiring pencil, solder wiring, etc.

With gold bus connectors and heat sinks — unassembled **$56.66**

GIMIX INC. 1337 WEST 37th PLACE • CHICAGO, ILLINOIS 60609 • (312) 927-5510 • TWX 910-221-4055

NEW SOFTWARE

Edited by Linda Stephenson

Apple Logo Is Here
Five New Packages for IBM PC
A New Mind Toy

New Edition of Pilot

An advanced disk version of Pilot for CP/M-based systems has been released by Ellis Computing, 600 41st Ave., San Francisco, CA 94121. Nevada Pilot is a string-oriented language for interactive applications such as data entry, programmed instruction and testing. Pilot helps a person with no previous computer experience develop dialog programs in an hour or so, and is an excellent companion language for Basic, Cobol and Pascal because it solves the training and documentation problem. New features include an integrated full-screen text editor and control of optional equipment such as video tape recorders and voice response units. Nevada Pilot requires 32K RAM and one disk drive; it runs on Apple II+, TRS-80, North Star and other CP/M-based computer systems. Price is $149.95. Reader Service number 482.

Fixed Assets for CP/M Computers

Designer Software, 3400 Montrose Blvd., Suite 718, Houston, TX 77006, offers a fixed assets package for general use in the accounting office. The package is useful for construction companies, manufacturing firms and larger professional organizations. An indexed database keeps records in order as they are created. The database is written in assembly language for rapid processing. It prints a complete list of fixed assets showing historical and current information; assets can be arranged and subtotaled by location and department within a location. Available methods of depreciation are straight line, double declining balance and sum-of-the-year's digits. For used equipment, you can call up a summary depreciation report which provides the information needed to post to the general ledger. Provisions are made for compliance with the new tax regulations. The fixed assets software is priced at $850. Reader Service number 483.

Music Lessons

Electronic Courseware Systems, Inc., PO Box 2374, Station A/Champaign, IL 61820, has published a series of three music lessons for the Apple II microcomputer. Elements of Music includes note name drills, pitches on the keyboard and key signature drills. The lesson disk includes a record keeping option for up to 50 students. Cost is $175. Reader Service number 484.

Data Comm Security For Apple II

How do you protect sensitive information when you have to send it over phone lines? Absolute Security provides privacy for your business or personal communications by encoding text files in an unbreakable "one-time-pad" code. You can send VisiCalc files, trade secrets, personnel records, legal briefs—*any* uppercase ASCII text file. Absolute Security, for Apple II DOS 3.3 and DC Hayes Micromodem II is priced at $79.95.

Dann McCreary Software, Box 16435-KM, San Diego, CA 92116. Reader Service number 487.

Super Software

Superscreen combines a file management system command interpreter and applications programs in one self-loading package, and circumvents the usual hierarchy of operating system, high-level language and program. The Superscreen work-processing package takes full advantage of the Intertec SuperBrain's special features: Its expanded ASCII character set lets you send any sequence of ASCII control characters to the printer at any time; SuperBrain's numerical keypad becomes an expanded set of cursor controls, increasing the effectiveness of the full screen editor; and Superscreen makes full use of the 64K memory and dual disks. Also available for North Star Horizon. Superscreen is priced at $500.

Creative Software Concepts, Inc., PO Box 349, Binghamton, NY 13902. Reader Service number 488.

Critical Path Management System

North America MICA, Inc., 11772 Sorrento Valley Road, Suite 260, San Diego, CA 92121, offers a full-scale critical path project management system, developed for CP/M, MP/M and CBasic2 systems. PMS-II's computation report generation provides information allowing a project manager to manipulate the project network for the best set of completion dates and project durations. PMS-II prints activity reports with sorting and data selection options, standard Gantt chart, graphic and tabular funding schedules and a network diagram that is updated as charges occur. PMS-II is designed to meet all governmental project management and reporting requirements. It satisfies both the Corps of Engineers specifications and Armed Services Procurement Regulations. It maintains budgeted and actual expenses for material and labor. Price is $1295. Reader Service number 485.

Do It Yourself

The Small Records System has easy-to-follow instructions for automated record keeping on a Z-80-based microcomputer with CP/M. Using the system's 19 major building block commands and many subcommands, a businessperson can program the computer for inventory control, accounts payable and receivable, aging of accounts, check register reconciliation, investment management and office management.

Small Records Associates, PO Box 302, Lisle IL 60532. Reader Service number 486.

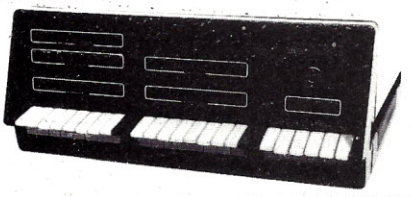
Apple Logo

Logo for the Apple microcomputer is here. Terrapin Logo, from Terrapin, Inc., 678 Massachusetts Ave., #208, Cambridge, MA 02139, lets young children control the computer without first having to know programming techniques—it encourages exploration and experimentation. Using turtle graphics, children naturally begin to learn about distance, angle and other math and geometry concepts. *Turtle Geometry*, by H. Abelson and A. diSessa, provides interesting and thought-provoking problems

Best prices anywhere. We beat 'em all!

COMPUTERS

INTERSYSTEMS



DPS1, DPS1A, DPS2A . CALL FOR PRICES

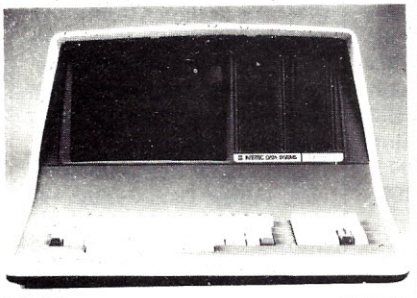
DYNABYTE

List . . . . . Less 30%

ALTOS

PLEASE CALL FOR PRICES

SUPERBRAIN
By INTERTEC



64K DD $2639
64K QD $2949
DSS-10MEG $3195

CROMEMCO

CS2, List $4695 . . . . . **OUR PRICE $3549**
CS3, List $7995 . . . . . **OUR PRICE $6349**

ZENITH | data systems

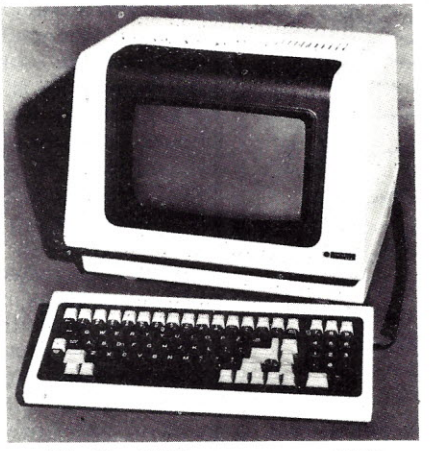


Z-89 . . . . List $2895

OUR PRICE $2139

TERMINALS

TeleVideo



Televideo 910C $589
912C $669
920C $725
950C $925
925C $729
INTERTUBE $725
Emulator $725

OKIDATA
Microline 80 . . . . . $436
Microline 83A $796

Qume . . . . . CALL FOR PRICES
C.ITOH . . . . . CALL FOR PRICES

SOROC

Soroc IQ120 . . . . . $649
IQ130 . . . . . $579
IQ135 . . . . . $719
IQ135 w/g $789
IQ140 . . . . . $995

HAZELTINE

HAZELTINE *ESPRIT* $579
1420 . . . . . $789
1500 . . . . . $849
1510 . . . . . $1029

ZENITH Z19 . . . **$669**

Most items in stock for immediate delivery. Factory sealed cartons, w/full factory warranty. NYS residents add appropriate sales tax. Prices do not include shipping. VISA and Master Charge add 3%. C.O.D. orders require 25% deposit. Prices subject to change without notice.

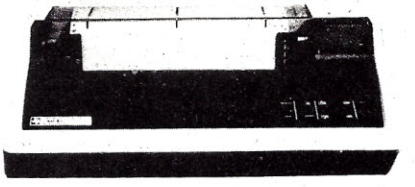
✓227

PRINTERS

CENTRONICS

739-1 PAR $749
739-3 SER $799
704-11 parallel $1569
704-9 (RS232) $1795

TI 810



810 Basic $1289
810 Full Option $1599
820 RO Basic $1545
820 KSR Basic $1739

NEC 7710 (RS232) SERIAL . . $2395
7730 PARALLEL $2395

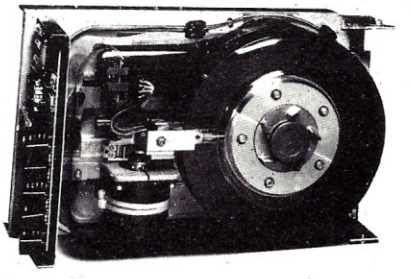
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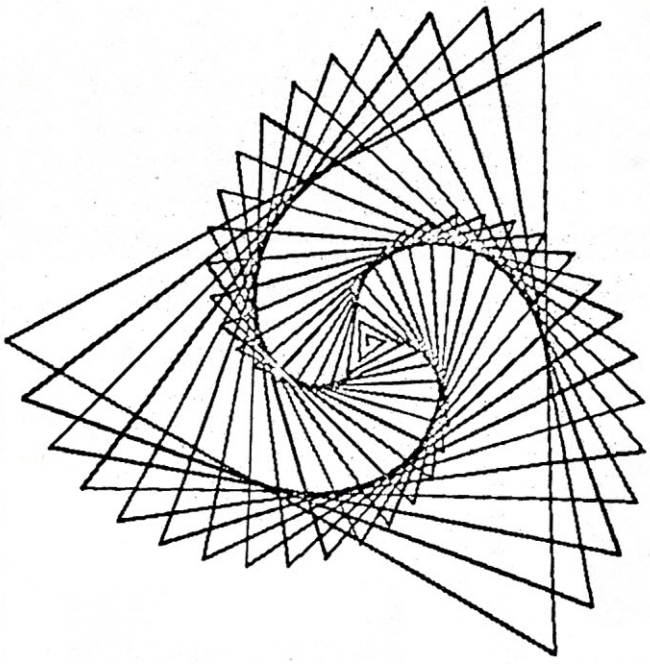
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The SQUIRAL illustrates how easy it is to create complex graphics figures with the Terrapin Logo language.

using turtle graphics on a more advanced level. Topics covered include geometry, statistics, topology and number theory. The program requires a 48K Apple II with a 16K RAM card or language card and one disk drive. Price is $149.95. Reader Service number 490.

Logo is also available from Krell Software Corp., 21 Millbrook Drive, Stony Brook, NY 11790. Krell's complete package includes the M.I.T. Logo language system, Krell's own instant Logo tutorial program, and *Alice in Logoland*. M.I.T. Logo is priced at $179.95. Reader Service number 463.

CP/M-80 Lisp

A new version of Lisp, an extensive, compact symbol manipulation language, is offered by Lifeboat Associates, 1651 Third Ave., New York, NY 10028. Stiff Upper Lisp provides interactive computing with more than 120 compiled functions in less than 14K bytes. Lisp functions and data have the same form, so one function can analyze another. Additional features include a library of functions that can be written and called as needed, symbolic debugging aids, a Lisp editor, online help facility, print formatter and a spelling correction function. Price is $165. Reader Service number 489.

Programming Aid

Advanced Operating Systems, 450 St. John Road, Michigan City, IN 46360, is issuing Macro-Mon, a machine-language program that disassembles and examines program instructions from any part of the computer's memory. The utility allows single-stepping through the computer's ROM. The user can load a machine-language program from tape or disk and begin interpretive execution one instruction at a time, with user-defined starting and ending addresses. It also allows user-defined time delays between instructions and user-defined break points to be set in ROM or RAM. It will disassemble each instruction as it is being executed. These instructions may also be sent along with all current register values to the video display or, optionally, to the printer. This program will also find any string (ASCII or hexadecimal) up to 16 bytes long in ROM or RAM. Macro-Mon is available for the TRS-80 Model I on cassette for $54.95 and on disk for $59.95. It is also available for the TRS-80 Model III on disk for $69.95. Reader Service number 491.

Five New Packages For IBM PC

Basic Business Software, Inc., PO Box 26311, Las Vegas, NV 89126, announces new software for the IBM Personal Computer. A package called Some Common Basic Programs contains all 76 programs from the book of the same name; price is $35. Finance Calculator, which performs the functions of a financial calculator, is priced at $30. Plotting plots a file of data points and sends it to any printer; price is $75. Amortization & Depreciation calculates an amortization and depreciation schedule and prints it on any printer; price is $30. IBM Basic Utilities is a complete set of utility programs to cross reference a Basic program and list programs to the printer; it is also a mini-text editor. Included are Basic subroutines for formatted input, messages, matrix input, matrix inversion, matrix multiplication, line drawing and file searching. This package costs $75. Reader Service number 492.

Ready Reference

MAGART.DB is a database citing hundreds of magazine articles (includes 1981 issues) of interest to users of CP/M systems. The database operates with Island Cybernetics' Information Retrieval System (IC-IRS). Included in the database are references to hundreds of articles, programs, information and reviews of software from *Microcomputing, Creative Computing, Interface Age, InfoWorld* and *Byte*. The database refers primarily to information about business programs and useful programming routines, utilities and software packages for CP/M systems. References can be retrieved by single or multiple fields. Available on eight-inch single-density and 5¼-inch single-density North Star disk. Price of MAGART.DB is $20; updates are $10. The IC-IRS is $54.95 when ordered with database.

Elliam Associates, 24000 Bessemer St., Woodland Hills, CA 91367. Reader Service number 493.

For Apple III

Medical Clinic runs under the SOS operating system and is written in Business Basic. The package is designed for a large medical office. It manages the physicians' appointment schedules, does patient recall, prepares appointment logs and provides for patient file management. The system also has a full accounts receivable system for managing daily transactions and payments, preparing monthly client bills and reporting aged accounts receivable. The billing element also prepares standard AMA-approved claim forms. The system will handle an unlimited patient base, using floppy-and/or hard-disk storage. The system is designed to improve professional cash flow with features like superbill, individual bill preparation and cycle billing. The package costs $1495.95.

Monument Computer Service, Village Data Center, PO Box 603, Joshua Tree, CA 92252. Reader Service number 496.

Multiwindow Text Editor

Santa Cruz Software Services, 1711 Quail Hollow Road, Ben Lomond, CA 95005, offers a sophisticated, multiwindow, full-screen text editor. The Electric Blackboard runs on Z-80-based microcomputer systems using CP/M. Minimum requirements are 48K bytes main memory, one disk drive and a CRT with cursor addressing. The Electric Blackboard lets the user divide the CRT into horizontal and vertical windows, each as narrow as one column or as thin as one line. Text is edited directly in each window and you can see the results immediately. Windows can be created or deleted as needed, and moved freely about the file in

all four directions. At any time and in any window, the user can load, save, erase, move text, replace strings and perform other functions. Priced under $200. Reader Service number 497.

Programming Gems

Jools is a package of UNIX-style software tools specially adapted for the CP/M environment. Sixteen tools are provided, including VSort, for high-speed internal/external sorting on either fixed- or variable-length fields; Find and Replace, to search for and replace text within files based on regular expression patterns; and Rearrange, to reorder fields of a line to a user-specified format. Jools provides modular problem-solving for the CP/M programmer. Jools is priced at $95, on eight-inch IBM single-density and 5¼-inch North Star double-density disk.

Pluto Research, PO Box 50444, Palo Alto, CA 94303. Reader Service number 494.

A New Mind Toy

Ricochet is a game of subtle strategy combined with fast action and arcade-style graphics. The game can be played against any of four different computer opponents, or against another human. The player maneuvers blocks to set up a shot at his opponent's goal and to protect his goal from attack. Each player has two launchers he can fire. His shots ricochet off the blocks, earning him points each time a block is hit; he gets bonus points for hitting his opponent's goal. Before he can claim victory, the player must win two out of three (or three out of five) games. A match victory also boosts his personal Ricochet Player Rating, which measures his mastery of the game against other players. Ricochet is available on cassette for the Atari 400/800 (16K with Basic ROM cartridge) and TRS-80 (16K, Level II), or on disk for Atari, TRS-80 and Apple II+.

Automated Simulations, PO Box 4247, Mountain View, CA 94040. Price is $19.95. Reader Service number 495.

Electronic Mail

Woolf Software Systems, 23842 Archwood St., Canoga Park, CA 91307, now offers a communication program that allows transfer of programs and data files between any two computers running CP/M, CP/M-86, MP/M, or MP/M-86. A program is supplied to configure Move-It for most popular microcomputers, even if they have incompatible disk formats. Move-It can be used for electronic mail over standard phone lines. It will display both local and remote directories and will send or get files from a remote computer without remote operator assistance. Move-It supports all data formats, including .COM files; it supports communication over standard RS-232, parallel or telephone lines. Network error checking and recovery techniques ensure the integrity of the transmitted file. Move-It costs $101.95. Reader Service number 498.

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Continued from page 210.

configure the program for the Trendcom 200, Paper Tiger and graphics-equipped NEC Spinwriters.

All the graphs in this article were printed on an Epson MX-80 equipped with the just-released graphics PROMs. I saved the plots with the "Save Pix" command and later used a screen dump.

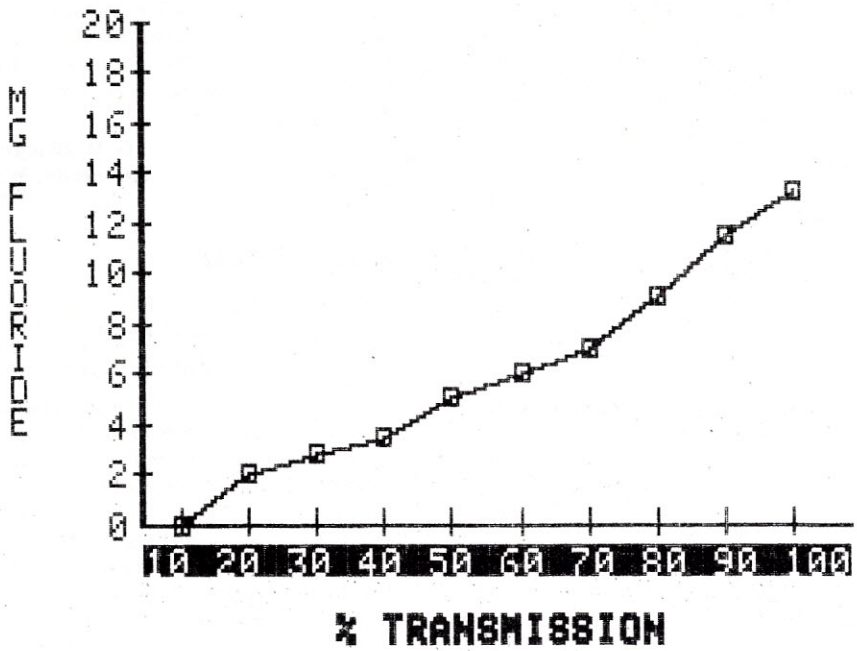
If you are willing to spend a lot of money, color printing is possible as well.

Everything is menu-driven, and what menus! The index lists 68 different menu functions. Once you learn most of them, you will not have to refer to the manual very often.

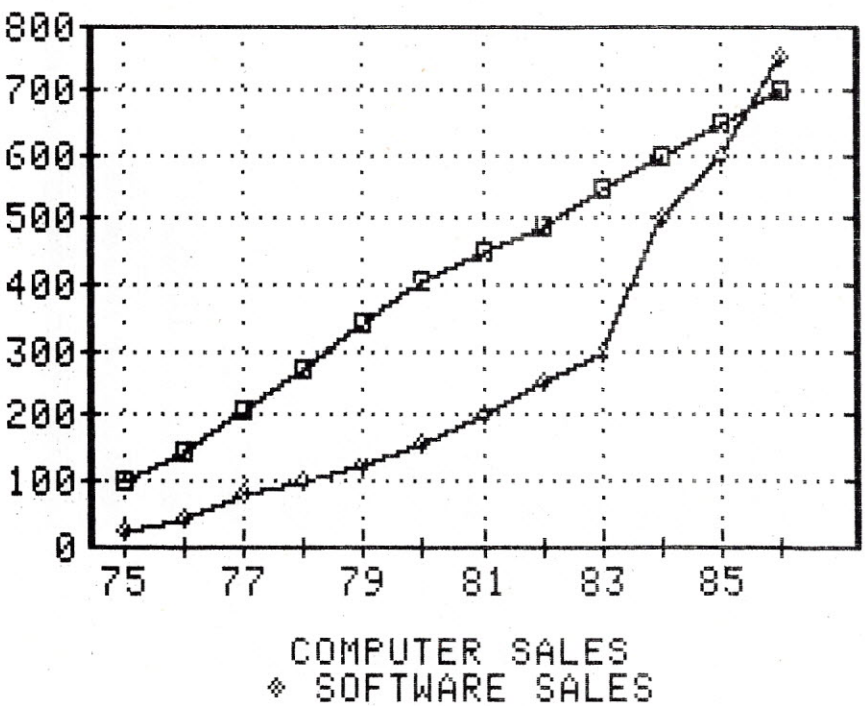
The VisiTrend/VisiPlot User's Guide is well-written, but somewhat short on examples. Perhaps this is due to the fact that to go into detail, it would need innumerable examples to illustrate.

Documentation begins with a general description of the programs. Included are the usual tutorial, a reference section and an alphabetic index. These are all useful, but require many hours of hands-on operation to master.

The system requires an Apple II+ or Apple II with the language card in ROM, 48K of RAM and at least one disk drive. Two drives make life much easier.



Example 3.



Example 4a.

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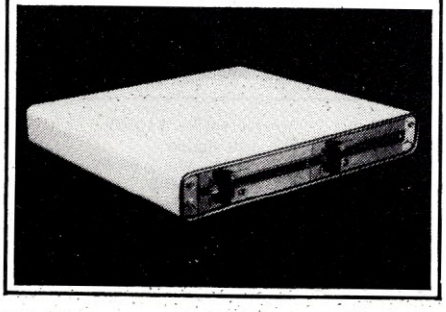
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Using VisiPlot to convert data into various forms of graphics is as easy as pushing a few keys on your Apple. Many capabilities can be combined on one graph. Examples 1a and 1b are examples of presenting corporate stock information. Line graphs and high/low bars are shown composed on one graph.

Data is normally entered in the edit mode, but VisiPlot and VisiTrend also accept DIF (data interchange format) files from VisiCalc.

Example 2 is the result of using the power of VisiPlot in combination with DIF files from the above VisiCalc data. With a minimum of effort the program constructed a pie chart, at the same time calculating and printing the percent contribution of each budget item in a box next to the pie chart. As you can see, the system does not draw a perfect circle.

You should realize also that in this case, direct entry of the data into the plot program would have been just as simple.

Titles for the graphs can be managed in many ways. Three lines of information can be placed at the bottom; they are centered automatically. For the Y-axis one line of labels is available.

In addition, there are movable labels. The high and low labels on chart 1a are an example.

Example 3 is a chart that would be used for chemical analysis. I changed the legend for the X-axis from dates to the range 10 to 100, which is the percent transmission corresponding to concentrations of fluoride in a chemical analysis.

Examples 4a and 4b illustrate the plotting of increases in hardware vs software sales as line and bar graphs. You decide which is the more dramatic for your presentation. Grid lines on chart 4a make points easy to decipher.

The VisiTrend/VisiPlot program can hold 16 data series and 645 data points at any one time. The maximum number of points on one plot is 150.

VisiTerm is a sophisticated program that generates statistics. The data can then be plotted if that is appropriate, or tables and data can be printed.

To get to the plot program from Trend, you first have to go back to the main menu. This is time-consuming, but the number of options on this disk makes this detour unavoidable.

Almost any kind of statistical function can be performed. Just feed in the data in the edit mode or from DIF files.

(Personal Software, Inc., Sunnyvale, CA 94086. VisiPlot—$180; VisiTrend and VisiPlot—$270.)

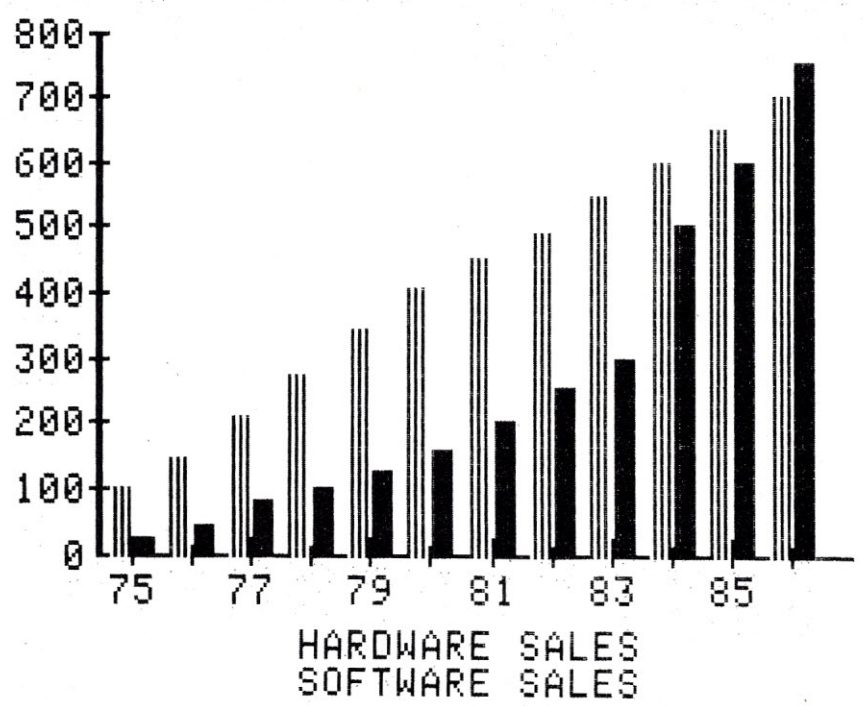
G. R. Brieger
Redmond, WA

Magic Spell

This program for 6800 Machines answered the prayers Of a poor-spelling chaplain

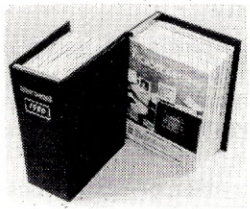
Most people who write for publication or for business purposes know the importance of correct spelling. I'm a lousy speller and I've wondered in recent years why my M6800-based microcomputer couldn't check my spelling for me.

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Example 4b.

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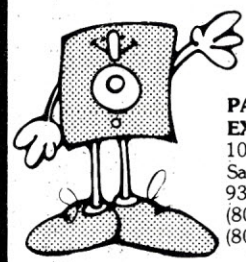
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works smoothly and efficiently.

Magic Spell is available for most 6800 disk systems. It comes complete with a dictionary of well over 10,000 words (and the dictionary is growing regularly, as people send Stark updated versions of their own).

The program has several options. It will mark all misspelled words and compile a list on the printer. They'll be marked in the text so a return to the editor will permit easy recognition and correction. Words not found in the dictionary can be ignored because you know they are correct. You can have a new version of the text made on the disk with corrected words in place of the misspelled words. Fabulous!

Additionally, the dictionary provided with Magic Spell is dynamic—that is to say, it will grow to reflect your own vocabulary. I'm a chaplain, and my vocabulary contains many words special to my trade. Additionally, I'm in the Army, which gives me another set of words specific to my job and living conditions. I've added a number of words to my copy; it now reflects my vocabulary as well as Pete Stark's.

The dictionary file can occupy both sides of a disk, so it is virtually unlimited in size. You could also create your own dictionary from scratch.

The program will also, with appropriate addition of a printer driver routine, print all misspelled words, creating an alphabetical list of the words in your text file that are not in the dictionary text file. A recent modification permits the program to run through the text file and create a marked list of misspelled words with no intervention on the part of the user. Normally, the user has to tell the program at each misspelled word whether to mark it as misspelled, add it to the dictionary or ignore it. But with the Fast Mark option, now standard, it will simply make a marked list of all words, and then ask whether you want to create a new, and corrected, text file.

The manual is thorough, easy to understand and easily remembered. The program prompts well, so there is little need to refer back to the manual.

When I consider that Pete Stark provides careful and thorough updating of his software for a simple SASE, this is a program I can't do without. It gets regular and constant use in my various writing projects (including sermons) and, along with the editor and processor, has to be the most used program in my library.

(Star-Kits, PO Box 209, Mt. Kisco, NY 10549. $89.29.)

Paul E. Phelps
King City, CA

Discat

Log up to 7200 programs On your TRS-80 With this utility

Discat is a utility program designed to aid the TRS-80 owner in creating an index of disk-program-location records capable of giving the following information:

- Program names and name extensions
- Diskette number where program is stored
- Program location on diskette (front or back side)
- Length (in granules) of each stored program
- Free disk space on each diskette

According to the excellent user's manual, a 32K system can hold in excess of 800 program location records. Each catalog of indexes can hold up to nine indexes, individually named by the user. The program library can contain over 7200 programs.

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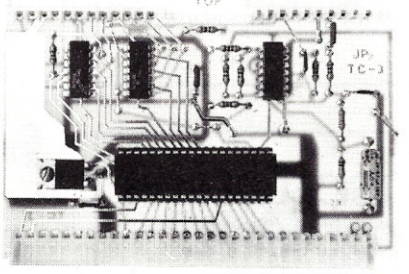
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17,000 program location records can fill over five disks with data.

Placing all of the 800 (or 1900) program records in an index in memory at the same time allows extremely fast access to the location of a particular program on disk.

Discat is written in machine code and, according to the user's manual, can:

- Load an index file containing over 800 records into memory in less than 15 seconds (1900 in less than 25 seconds)
- Search for the location of a specific program in less than three seconds (for an 800 entry file)
- Automatically keep track of free space available for each of your diskettes
- Allow changing the active drive from 0 through 3 for use by systems with more than one disk drive when in the automatic-directory update mode
- Allow manual program/disk number entries for those special cases such as foreign operating systems (similar to CP/M, VDOS, or other diskettes without a normal directory system) where the diskette number and contents need to be added to the index and cannot be read from the directory of the diskette automatically
- Provide for printed copies of the indexes in the catalog, either in a single- or double-column format
- Sort the index by either program name or number; it can sort 800 entries in 25 seconds or less, 1900 in 65 seconds or less
- Delete either program or entire disk in a matter of seconds. Caution must be used with this mode. It does provide some very good prompts to help prevent needless losses
- Clear the current index from memory in order to start a new index without rebooting and also provides an exit from the program
- Save the file to the same index or to select a new index after file maintenance is finished
- Allow up to 100 disk numbers in each of the nine index files. It is possible to use up to a maximum of 9999 different disk numbers. By making up different indexes on other disks it is possible to build a library of programs on numbered disks that could be arranged in ten 1000-diskette catalogs

Discat is completely menu-driven and is therefore easy for anyone to use. It also gives plenty of warnings where errors could be costly.

When we started using Discat we had over 1500 programs and had made no attempt to organize them by subject. It took about two hours to catalog, and the speed at which it finds any given program is fantastic. We chose to make one index of our master (original copies), which has been extremely useful.

Our only complaint is not a serious one. One of the other programs we used allowed comment-lines in the hard copy of the catalog. This isn't possible with Discat, but its loss is more than compensated for by the capacity, speed and ease of use.

Although we didn't test this program with a large variety of operating systems, it's compatible with most operating systems, including NEWDOS80. It is not compatible with double density.

This program is definitely a must for anyone with a varied program library. *(Racet Computes, 1330 N. Glassel, Suite M, Orange, CA 92667. TRS-80 Models I and III, 32K or 48K $50.)*

John and Nikki Newman
Medford, OR

Falcons

You won't get bored
Fighting off aliens
In this arcade game

I've never been a fan of arcade type microcomputer games. Maybe my reflexes are too slow or my attention span too short, but I usually get bored after a few



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minutes of Space Invaders. Adventure games are more my style. I like to bang my head against the pyramid wall after the little Arab shoots me and steals my loot, because I am elated when I get my chance to blast the little bugger later on, even if it does take me an hour to get back to that spot in the game.

I was prepared, therefore, to tire quickly of Falcons, because it does require fast reflexes and the stamina to withstand a practically never-ending onslaught of falcons. But wait a minute. Here it is an hour later and I'm still fighting them off. Why? Because if I can blast through the four different formations of falcons, I can get a shot at this little cartoon-like alien in a big space ship right out of *Close Encounters of the Third Kind.*

And those colors! You really should have a color monitor to appreciate the graphics of Falcons. The title page alone nearly blew me away—it presented a full-screen-sized orange falcon with vicious yellow eyes and green legs framed with the word falcons in bright blue letters.

I was prepared for a letdown after this impressive display. Instead, after I answered a few simple questions about keyboard, joystick or game paddle play, I was mesmerized by a demonstration of the five separate attack forces that I was soon to face. There were standard Star Wars Federation-type fighters in the first two waves, followed by blue and green and then orange and green falcons in the third and fourth waves. These latter two waves came at you as tiny balls sweeping back and forth across the screen, growing larger and finally turning into deadly invaders, wings fluttering with menace. I began to feel an involuntary twitch in my trigger finger.

Then came the fifth wave. Descending from the top of the screen with imagery reminiscent of both the opening scene in *Star Wars* and the mother ship sequence in *Close Encounters of the Third Kind* came the ultimate target of Falcons—a green-and-orange flying saucer with a white band around the middle and a strange looking alien as captain. The instruction booklet told me this was my goal—blast the alien and I would be a winner. Easier said than done, because a wave of fighters similar to the first two waves I had seen descended to protect the mother ship.

All this and I hadn't even started to play yet!

Playing turned out to be a substantial challenge. The attack forces shoot at you, of course, and dodge your shots. They speed up as you deplete their number. And the third and fourth waves dodge randomly, and can even dodge an approaching shot from your cannon. Many of the falcons are either infants in training or mothers-to-be, apparently, because certain hits cause the target to break in half like an egg—these hits are worth 200 points on the counter at the top of the screen. After a while, you'll find you take a certain relish in blasting these eggies.

The graphics, created by authors Eric Varsanyi and Thomas Ball, are first-rate. Written for the Apple II, II Plus and Apple III, this is the most sophisticated space invaders type game around for microcomputers. It has the standard features of this genre—three ships is all you get unless you score 10,000 points, you can move right or left but not up and down, there is a protective shield you can employ, etc.

If you should happen to see Falcons demonstrated at your local computer store, don't be fooled into thinking it is easy to win just because the store owner can do so. There is a dealer demonstration version that allows the dealer to set the game up so that the falcons do not shoot back, or the dealer can get unlimited ships, plus other options to make it impossible to lose.

Arcade games may not be your poison but if you do tend to be video-voracious, Falcons may be the best of its kind.
(Piccadilly Software, 89 Summit Ave., Summit, NJ 07901. Apple II, DOS 3.2 or 3.3, or Apple III, $29.95.)

G. Michael Vose
***Microcomputing* staff**

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For the Apple computer

If you have an Apple II computer and would like to produce form letters and labels automatically from a mailing list, you might consider the Easywriter and Easymailer programs.

Easywriter is a word processor program. Easymailer lets you merge data such as names, addresses and company names from an Easymailer file with a standard form letter created by Easywriter.

To use Easywriter and Easymailer, you'll need an Apple II or Apple II Plus with 48K RAM, a disk II with controller card, a video monitor or television and a printer with printer interface card.

According to the manual, most printers and interface cards can be used. A letter-quality printer will produce professional-looking documents and can take advantage of such special functions as incremental spacing and bold print.

Before I had acquired the Easywriter and Easymailer programs, I typed a form letter for my customers, made over 100 copies, and signed and hand addressed each one. Each mailing required several hours of work, the kind of work I don't like: repetitive and noncreative.

Using Easywriter and Easymailer, the major time-consumer is typing the mailing list. After writing a form letter with Easywriter, names and addresses are inserted by Easymailer to produce a personalized letter. I also use Easymailer to address the envelopes. As you can see, this saves time, time that can be used for more productive work.

Easywriter

The documentation for Easywriter consists of over 60 pages of text. A quick-reference card is also included. I give it a fair to good rating, although I have seen other reviewers rate it higher. This makes me wonder if I have the same version. Its largest shortcoming is the lack of an index. When you want to look something up, some thumbing through the pages is usually required. After spending many hours familiarizing myself with Easywriter, the quick-reference card was all that I needed for most uses.

The Easywriter program consists of three systems—the Editor, the Disk Filing System, and the File Printing System. The Editor is where you will spend most of your time, entering and editing text. The Disk Filing System is the disk operating system (DOS) of Easywriter. Files created by Easywriter are not readable by the Apple DOS, and vice versa; you are limited to using files created by Easywriter. However, the disk filing system operates much faster than the Apple DOS, and provides a summary of the space left on the diskette. Existing files are accessed by file number rather than file name, so only one or two keystrokes are needed. The file printing system takes care of the actual printing of the text file. Printing formats such as line length, margin position, page length and line spacing can be specified before printing, or specified and changed within the text by imbedded characters.

I found that Easywriter lends itself well to producing one-page letters. After you get to know the program, it doesn't take long to produce professional-looking documents. If your printer has proportional spacing, excellent results can be obtained. Spaces as small as 1/120 of an inch can be inserted between letters to make the justification come out perfectly. Otherwise you may notice some large gaps between words.

Working with multipage documents or documents with variable margins is more difficult. There is no ability to print just one page at a time; the entire file must be printed. I encountered another problem when I wanted to make a resume. I needed to place labels justified to the left of the paper, but I also wanted the text to start indented ten spaces on the same line, and continue this indentation for the following lines. I didn't come up with any easy way to do it.

Easymailer

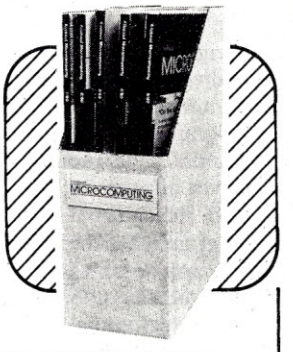
When the Easymailer program arrived I was anxious to put it to use. I booted the

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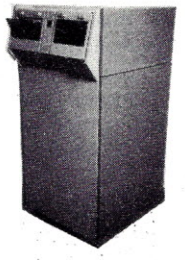


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disk, and then entered the system configuration information; the information scrolled off the screen, and the Apple locked up. I read the instructions again, and couldn't see where I had done anything wrong. I phoned Information Unlimited Software, and learned that the printer should be on when you start the program; this was not mentioned in the manual. The remedy was to turn the power off, remove the printer interface card, then start all over again. When the program looks for a card in the specified slot, and doesn't find one, it asks for the configuration information. This also was not in the manual.

With the printer turned on, I still had the same problem. I called IUS once more. As it turned out, the printer interface card I was using at the time, a CCS serial card, did not work with "CCS" specified in the configuration section. This was due to the fact that I was using an "old" version of the card (eight months old). The fix was to specify "custom" in the configuration section.

Other than the above-noted omissions in the manual, I found the Easymailer documentation to be an improvement over that of the Easywriter. It is clear, provides a good tutorial and has an index.

Easymailer consists of four main sections. The Design Section allows you to design the format of your mailing list. Mailing list information is entered via the Data Entry Section according to the format specified in the Design Section. In the Browse mode you are able to browse through records already entered in the mailing list to change, erase or print them. You can search for a specific record using a previously defined keyfield. In addition, you may print a form letter or label from this mode, as well as the Main Printing System. The Main Printing System is used when you wish to print letters or labels, using all of the names in the mailing list. With continuous paper this is an automatic process.

Information specified from the mailing list can be inserted anywhere within the body of a document. This is done by imbedding a special character in the Easywriter file, followed by the field number of the Easymailer design you wish to insert.

Drawbacks

I found the Easymailer program somewhat cumbersome to use. A typical sequence required to print form letters is:

1. Boot the Easymailer program diskette.
2. Insert the Easymailer data diskette.
3. Insert the Easywriter diskette containing the desired source document.
4. Reinsert the Easymailer data diskette and begin printing. Disk swapping is substantially reduced with two disk drives.

Easywriter and Easymailer are not compatible with a lowercase adapter; capital letters are produced by pressing the escape key, once for a single capital, twice to lock. Capital letters are represented in inverse video.

The printer must be on to use the Easywriter or Easymailer programs. If you want to move your computer to another room to do some editing, you will have to lug the printer along, too.

I would like to see the capability of printing letters from a certain range-of-design field.

Each Easymailer Data diskette can contain only one design and set of data. If you want several separate designs, you must use several diskettes.

Conclusion

The Easywriter and Easymailer programs do have a few drawbacks. However, they do work, and it is hard to find software with all of the features that everyone wants. If you occasionally need mailing list capabilities, they may be useful to you. If you are doing a large volume of mailouts, more sophisticated, and more expensive, software may be necessary.

Additional program or data diskettes can be produced from the Easywriter program, but the Easymailer program is not copyable by conventional means. A backup copy of the Easymailer program will be sent to you after your registration card has been received.

(Information Unlimited Software, A46 N. Broad St., Griffith, IN 46319. About $100 each.)

Lee Shuck
Kihei, HI

Text Wizard

At last, a good Word processing program For the Atari computers

I love to write. I also love my family. My family does not love my writing because I use a microcomputer to do my work, and every microcomputer I've tried disrupts our TV reception. Every microcomputer, that is, except the Atari 800. The 800 is designed to keep the radio frequency energy generated by its digital circuits locked inside its cabinet.

Unfortunately, no word processing programs available for the Atari were good enough for serious writing. I could play games on the 800 and use it for data communications, but I had to return to "dirtier" machines to get any work done. Now, thanks to DataSoft, Inc. and their Text Wizard word processing program, I can write and watch the football game on channel 2 at the same time.

The Quiet Atari

First, a quick review of the Atari computer systems is in order. There are two Atari computers, the 800 and the 400. The 400 is an economical device with a flat keyboard and limited memory capabilities. It will, however, interface with a disk drive, and can use Text Wizard. The Atari 800 is a powerful and professional machine. Both computers use a 6502 CPU and both have excellent color graphics and sound. The Atari systems rely on a family of intelligent peripheral devices to expand their capabilities. An interface module provides four serial ports and a parallel port for driving modems, printers, and other devices. The disk drives contain internal programming which allow them to quickly and simply interface with the microcomputers with no changes within the computers themselves.

To use Text Wizard, you need a fully equipped Atari 800 or 400. The systems need at least 32K of RAM, one disk drive and the 850 interface module. (Plus a printer and display device, of course.)

Text Wizard Features

Text Wizard is a full-screen text editor with all of the options you would expect to find in a well developed program. It provides full control of the cursor and vertical scrolling of the text on the screen. All of the word processing functions are directed through the use of the control key. The author of the program selected very reasonable key combinations to signal the various commands. Additionally, he was able to make good use of the special keys available on the Atari. Movement arrows, delete, insert and many other phrases are already marked on the Atari keyboard.

The insert function allows both character and line insertion. The color graphics capabilities of the Atari are used nicely throughout the program to show the user when a special command or condition is in effect. When the program is in the insert mode, the border of the screen changes to green. This is nicer than the little signs or symbols some programs use, because your eye doesn't have to travel very far to determine if insert is in effect. Writer inserted carriage returns and other editing marks are shown in reverse video. Various important commands appear in vivid color to grab your attention.

The delete function allows removal of blocks of text, lines, characters to the right of the cursor and characters to the left of the cursor. This left-delete feature means that if you recognize a typing error you just made, you do not have to back up the cursor and delete. This destructive backspace is very handy as long as you have arrow controls to do nondestructive movement. The destructive backspace also works in the insert mode, so you don't have to carry a pile of bad characters in front of the cursor if you make a typing error while in the insert mode.

Text Wizard does a good job of finding, moving, changing and duplicating words and phrases in the text. Again, the extra

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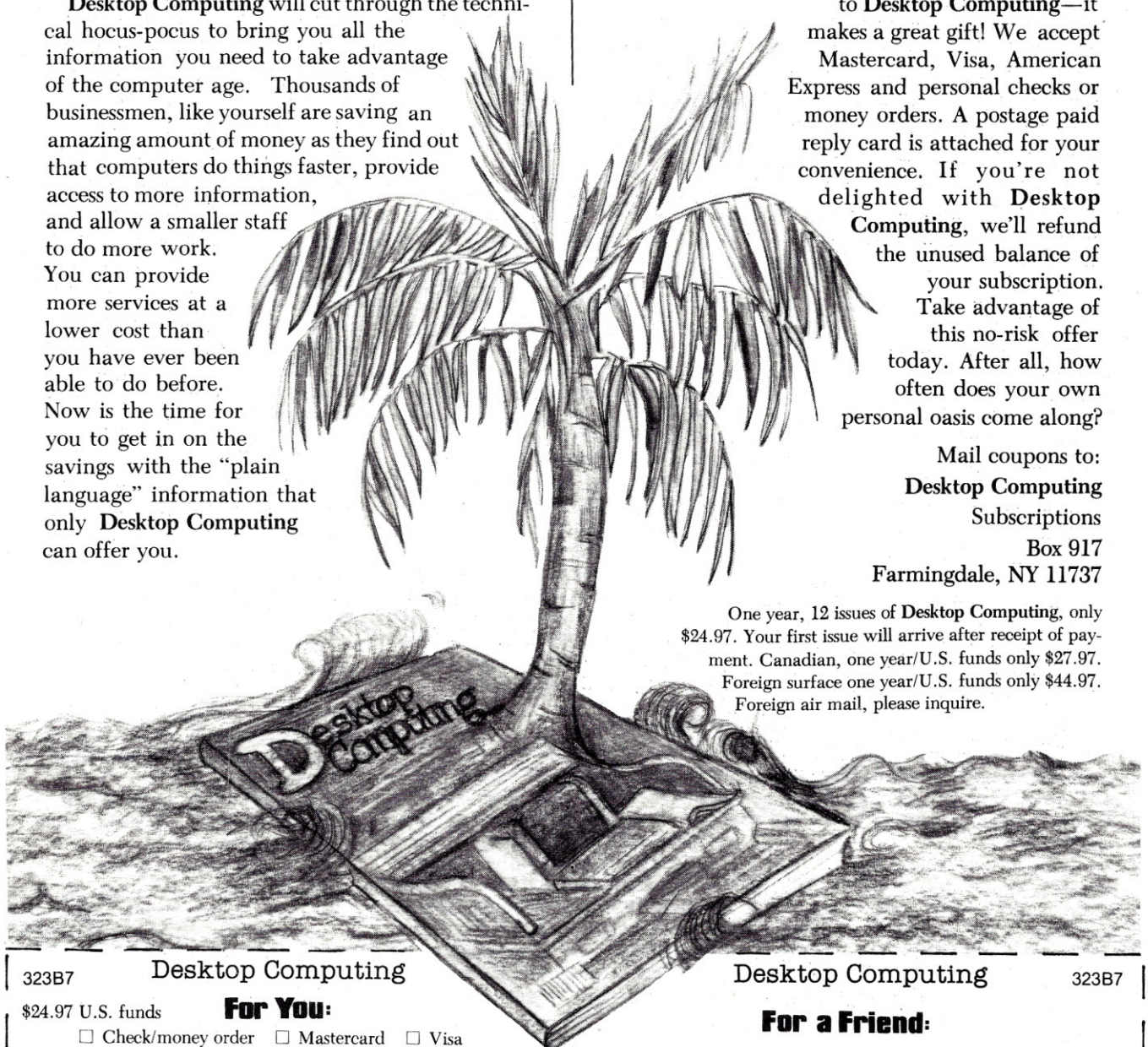
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keys on the Atari keyboard are a help because they can be used to call for a function logically associated with their name. To search for a phrase, the user pushes the Atari select button and the letter S. Replacing a phrase requires the use of the select button and the letter R. There are no difficult codes, commands, character spacing formats or multiple key combinations to remember.

This ease of use is typical of the entire Text Wizard program. It is easy to install (insert the disk and close the door), easy to use as an editor and easy to use as a print formatting program.

Printing

The Atari displays a maximum of only 40 characters per line. This means that what you see on the screen is not what you will see on paper if you use standard printing widths. Some special commands are available in Text Wizard to let you set printing parameters, including all margins, line spacing and spaces between pages (form feeds), and spaces between characters on printers which will support this function.

The margins can be set precisely because the software divides every inch into 150 possible print positions. This works out nicely for filling in preprinted forms on a repeating basis. Line spacing can be specified by half lines for precise control.

The only feature I sometimes use that Text Wizard does not provide is control over the length of the printing run. This is handy if you only want to print a few paragraphs out of a document and not the entire file.

Text Wizard contains special features for use with the Epson MX-80, Atari 825 or Centronics 737 printers. (Although not specified, it should give full width control on the Epson-100 too.) The Centronics version of the program comes on one side of the disk and the Epson version is on the other. The manuals in early program packages, which you may still find in a dealer's stock, don't mention the two-sided feature of the disk, but the disk itself is labeled.

Elongated, condensed and double-struck printing modes can all be selected with a quick one-key control code. The program will also provide for subscripts and superscripts in printing. If a Centronics 737/Atari 825 is being used, Text Wizard will provide for double-column printing. This feature can be greatly appreciated by anyone who puts out a newsletter or newspaper format document. It is also very useful in report writing.

The other Text Wizard printing features include the insertion of headers and footers, page numbering and optional justification within the text.

Disk Functions

Text Wizard works well with the Atari disk system. The disk directory is available for viewing and text can be saved under a file name that is different from the original. The program itself comes on an uncopyable disk. A backup disk is available at the time of software registration for $5. A replacement disk costs $30.

The program is a little more awkward to use than many word processing programs on other computers because the program is not present on the disk used to record the text files. If you have a single-drive system, you have to boot up with the Text Wizard disk in the drive, remove it and insert a file disk before you save or read in any text. The program does not read in any overlays or reload itself during operation, so there is no need to reinsert the program disk, but the disk-swapping can be inconvenient.

Another minor inconvenience is the need to place the cursor at the top of the file before the text is saved. This method of designating the data to be saved cost me several frustrating moments when I found I had lost a part of my file. If you quickly realize what you have done, it is possible to reload the file and merge it with the text that was left behind, but if you save the file and dump the program the data will be lost.

It is easy to merge or insert text files anywhere in the work area. A file of information that is repeatedly used can be inserted wherever it is needed as many times as it is needed. This can be done up to the limit of the available memory. A very nice printing feature allows the chaining of files for printing. This means that you don't have to bother reading in multiple files if you are printing out a long document. You can simply chain one file to another by specifying the file name of the next file to be called at the end of each file. The system will print them out like one long continuous document.

Documentation

The Text Wizard instruction book is clearly written and easy to use. Its 56 pages are enclosed in a small, easy-to-handle three-ring binder. Illustrations show the way text will appear and which keys are used to produce the desired results. A tutorial runs the user through a sample text. A table of contents and index are both included. My instruction book came with several additional pages for insertion so it seems that DataSoft, Inc. is continuing to update the documentation along with the program.

(DataSoft, PO Box 1061, Edgewood, MD 21040. Under $100.)

Frank J. Derfler, Jr.
Herndon, VA

Tax/Saver

Use micro power
To beat the IRS blues
At tax time this spring

When the afternoon of April 15 comes around and you're still staring at a pile of W-2 forms and various receipts and other paperwork, and wondering whether to file the short form or do it the long way and itemize deductions, that's the time you're going to wish you had Tax/Saver for your TRS-80.

I was a little frightened when the Tax/Saver package arrived because of its sheer size—there are five disks, and all contain programs.

There is no disk operating system on these platters, and all prompts call for disks to be mounted on drive 1. Tax/Saver requires at least a two-drive system, but should be compatible with any of the popular operating systems.

Once into the program, my fears were dispelled. Tax/Saver is self-prompting, with breaks now and then (called check stop) to check the accuracy of the information which has been input.

Documentation consists of a three-ring binder with over 40 pages composing almost a minicourse in tax preparation. In addition, plastic holders for the disks are included. A glossary in the back contains several pages of words and terms with which the nonprofessional may not be familiar. As an example of the thoughtfulness that has gone into this package, these words are set off by asterisks whenever encountered in the program text.

Notwithstanding Tax/Saver's self-prompting, read the manual first. Then prepare for a session by collecting the documents you'll need: W-2 forms, bank or other interest information, stock dividend information, pension or annuity income statements and so on. You get the idea—anything pertaining to income.

In addition, you'll need dependent information, and, if you're going to itemize deductions, you'll need information on medical expenses, taxes, interest, contributions, casualties and miscellaneous expenses.

Incidentally, Tax/Saver will help to determine whether a particular person qualifies as a dependent.

As you begin the Tax/Saver session, the first questions will be for page 1 of form 1040. These include name and marital and dependent status. If married, you are given a choice of filing jointly or separately, or figuring the tax both ways to see which is more advantageous.

From this point, data on income and expenses are entered. As different categories of income or expenses are covered, you're prompted to insert the proper disk.

It is not necessary to do everything in one sitting. From time to time, you'll have the chance to save everything entered so far into a disk file.

When you're entering information from W-2 forms, a representation of the form is drawn graphically on the screen

and blocks are filled in one by one. At the conclusion, you can correct mistakes.

At the conclusion, I was expecting such a message as, "Your adjusted gross income is such-and-such—look up applicable tax in tables." Well, I had a surprise coming. Tax/Saver does the table lookup for you! And it then tells you where to enter it on the form 1040.

In fact, after all computations have been made, you're led line-by-line through the 1040 and told what to enter on each line.

You're then told how much of a refund you have coming if you have overpaid, or how much additional tax is owed.

I redid my 1980 tax computations as a check on Tax/Saver and came out with the same figures all the way through.

Although Tax/Saver is designed for individual use, it would undoubtedly be of benefit to many small tax services.

The version I reviewed was for the 1980 tax year. For 1981, several enhancements will be added. These include:

- Two types of printout to the lineprinter in addition to the screen output. One format will be for submission to the IRS. The other is a printout with explanations, similar to the screen format.
- Detailed storage of information on disk.
- Optional program text, which is divided into two types. One is tax information for those who lack a sophisticated tax knowledge. The second is running instructions. Since both types are optional, help is provided for the novice while the professional is able to dispense with text.
- Additional screen formatting, combined in many cases with check stops, for easier input and verification.

An expanded version, Tax/Saver II, will handle additional forms such as business income/loss and capital gains/losses.

These additions should make the package even more useful.

In addition, a new program, Tax/Forecaster, is offered. This program can be used all year to calculate how your financial decisions will affect next year's taxes. It may also be used for making revisions of already-completed Tax/Saver returns.

Tax/Forecaster is a stand-alone program, but can be purchased at a substantial saving if bought at the same time as one of the Tax/Saver packages. Price is $49.95 alone or $29.95 with Tax/Saver.

New also for 1981 is a package of overlays for IRS forms not available in tractor-feed format. By means of an overlay, the data can be printed on plain white paper, then duplicated with the overlay on a copying machine for instant forms. Price for the package is $39.95.

(Micromatic Programming Company, PO Box 158, Georgetown, CT 06829. Tax/Saver—$79.95; Tax/Saver II—$119.95.)

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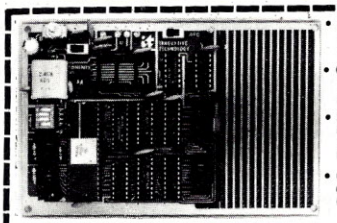


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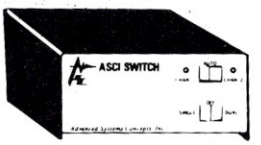
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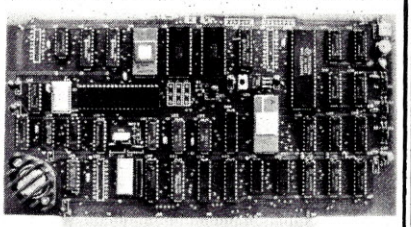
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VisiTrend and VisiPlot bring to the Apple computer owner the ability to treat statistics and graphing as easily as VisiCalc does mathematical calculations. Like VisiCalc, the Trend/Plot programs lend themselves to the now famous "what if " projections.

Both Plot, which can be bought separately, and Trend, which comes on one disk with Plot, are written in Applesoft. This makes the programs more versatile, since some parameters can be reprogrammed, and Applesoft functions can be used. The Basic, of course, executes much slower than the machine-language VisiCalc. Speed, however, is not as important here as ease and flexibility of operation.

Neither of the programs is learned quickly, with VisiPlot the far simpler. If you want to have a lot of pictorial displays in the form of graphs, this is the way to do it. Line charts, bar graphs, area charts, pies, high/low plots and scatter plots are available.

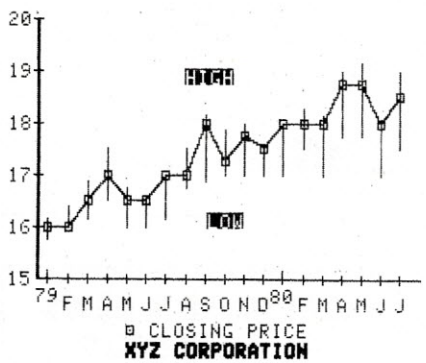
Not all data will fit all of the options. The programs were written by Mitchell Kapor of Micro Finance Systems and are tilted strongly towards time-based finance. This is an unfortunate limitation, since the scientific community would be apt to use these programs more readily if the proper options were available. It would be nice if you could easily plot, for example, percent transmission vs mg of ion or pH vs concentration. Instead this takes quite some manipulating.

The VisiTrend program will delight anyone in need of statistical treatment of data. On the other hand, if you are not familiar with such terms as standard deviation, mean or coefficient of correlation, buy a book on statistics first. Or you may not want VisiTerm at all.

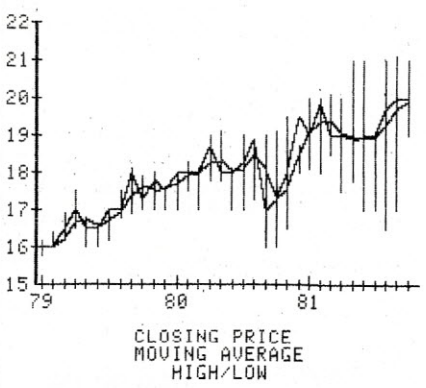
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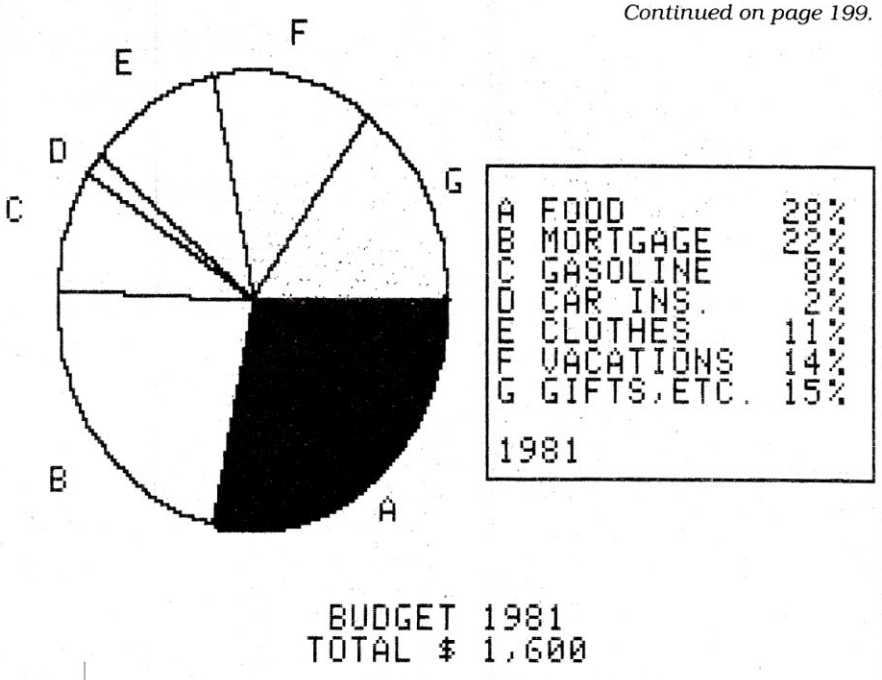
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Example 1a.



Example 1b.



Example 2.

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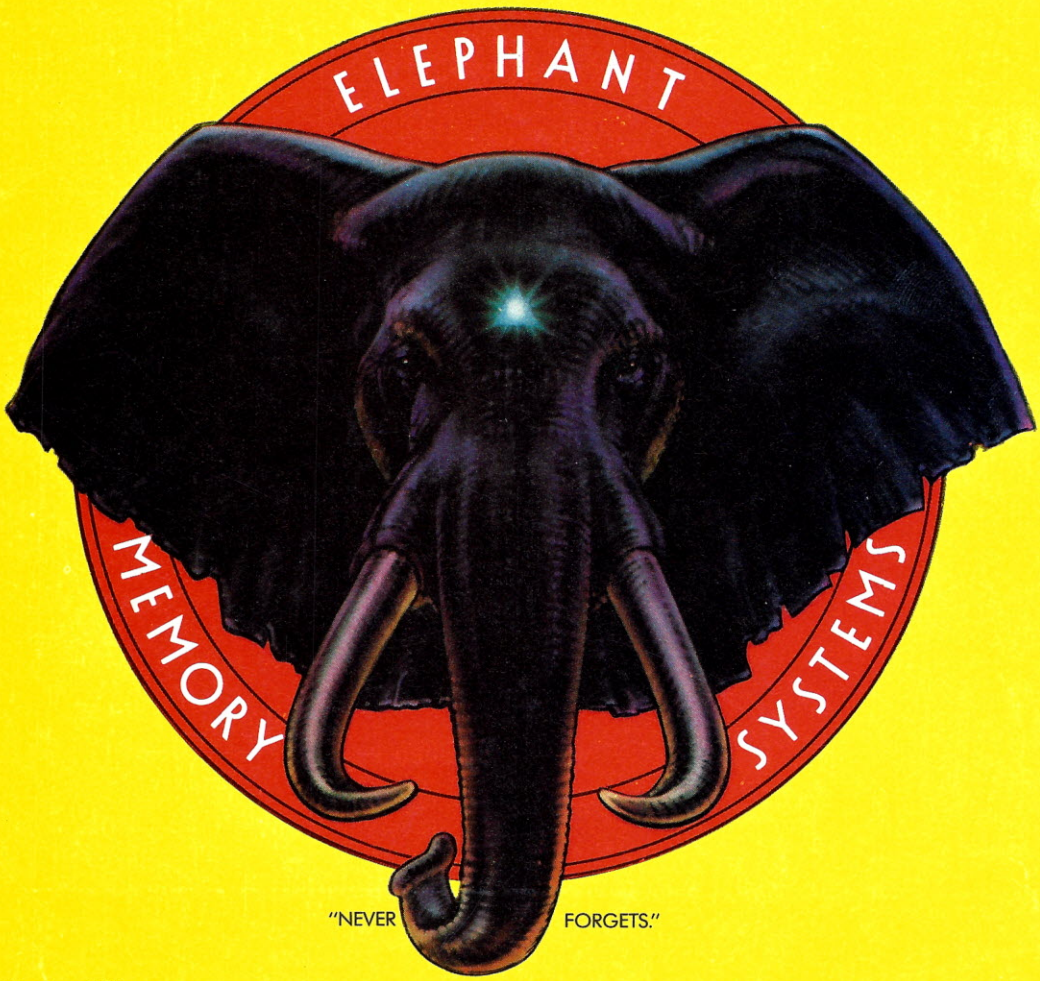
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